Issued Weekly by the
Hill Publishing Company
JOHN A. HILL, Pres. ROB'T MCKEAN, Secy.
505 Pearl St., New York.

Monadnock Bldg., Chicago.
6 Bouverie Street, London, E. C.
Unter den Linden 71—Berlin N. W. 7.

WALTER RENTON INGALLS, Editor.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engmnjour, N. Y.

CIRCULATION STATEMENT

Of this issue 9000 copies are printed.

None sent free regularly, no returns from news companies, no back numbers. Figures are live, net circulation.

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The Engineering and Mining Journal

Vol. 94. SEPTEMBER 21, 1912 No. 12

Aluminum

In view of the broadening uses of aluminum and its possible substitution for copper in electrical and other work, it is of interest to trace the recent course of the metal in the markets. The dissolution of the old aluminum convention in Europe nearly three years ago, was followed by a strong competition among the makers of the metal in France, Germany, Switzerland and England, which brought the price of ingot aluminum down below 12c. per pound; the metal being quoted at London in January last at £52@54 per long ton, which is equal to 11.30@11.73c. per lb. These low prices resulted in large imports into this country, and also brought about low prices here. The imported aluminum made the market here and the quotations for No. 1 ingots in New York at the first of the year were 18½@19c. per lb., duty paid, which was about the parity of the London price. American producers never formally cut their quotations to so low a point, but they were forced practically to meet the foreign competition to hold their trade.

At prices under 12c., the foreign companies, with possibly one exception, claimed that they were losing money, and this state of affairs gradually brought about a disposition to compromise their dissensions. After long discussion, a new convention was formed, which included all the important producers. The first and immediate result was a general and rapid advance in prices, which went up to £72@74 per ton in London—equal to 15.68@16.08c. per lb.; while £80 per ton—17.73c. per lb.—is quoted for next year's delivery. For obvious reasons the American producers could not join the convention, but they profited by the advance; the foreign quotations continued to control the market here, which now stands at about 25c. The advance does not seem to have checked the consumptive demand, which has continued good. While a good part of the increased demand for the metal comes from the automobile trade, there are other uses, especially in electrical work, which have expanded largely of late. It is in these that aluminum has come more or less into competition with copper. Considering the specific gravity and bulk, aluminum has been for some time the cheaper metal, but its use must be limited by the present comparatively small production. Preparations are being made, however, to increase this output, and it seems likely that larger supplies will be available within a year or two.

In this country accurate statistics of production are not available, but it is estimated that the quantity of ingots made in the first half of the current year approached, if it did not exceed 20,000,000 lb. The imports for the half-year were 10,660,668 lb., exceeding considerably the production. The total supply, therefore, exceeded 30,000,000 lb., which is the largest quantity ever reported in a similar period. We do not hear of any large stocks held anywhere, so that it seems probable that most of this metal has entered into consumption.

By far the larger part of the aluminum imported into the United States is marketed in the form of ingots or crude metal to be made into finished forms. This is to be expected, since the duty imposed by the tariff on ingots is 7c. per lb., while 11c. is charged on sheets, tubes, rods and other finished or partly finished forms. Statistics as to domestic aluminum cannot be obtained, but expert estimates are that approximately 35% is sold by the makers in the form of ingots to manufacturers, perhaps 20% as wire and 45% in other finished forms. The quantity of wire, however, is variable, since it is taken largely for electric transmission purposes, and the purchases are generally in large quantities, contracts for which come at very irregular intervals.

The aluminum industry is just now of especial interest, not only because of the

conviction that it is a metal that is destined to grow even more rapidly in industrial importance, but also because of the serious technical developments that are taking place in it. Undoubtedly, our second statement follows from our first. Chief among these developments are the organization of the Southern Aluminum Co. to establish competition in the American manufacture of aluminum, the introduction of the Serpek process, and the efforts to put the Cowles process on a commercial basis.

The Serpek process consists in treating purified bauxite in the electric furnace with air and coke, forming aluminum nitride, and then treating this product with caustic soda, which forms sodium aluminate and ammonia. The former is used for aluminum production, the latter to produce ammonium sulphate.

The Cowles process is a late development intended to use all of the metallurgical pig but the squeal. Clay is mixed with salt and carbon (the latter only that it may burn out and leave a porous briquette, just as in the manufacture of some building bricks), and is treated with steam and air. Sodium silico-aluminate and hydrochloric acid are formed; the latter is condensed to a commercial product. The sodium silico-aluminate is then decomposed with lime, giving calcium silicate and sodium aluminate. The latter is used to manufacture alumina and soda, the former is calcined with more lime and makes a white hydraulic cement.

The Cowles process, which is described fully in another part of this issue, has been developed at Sewaren, N. J., and commands especial respect from the name of its inventor, Alfred H. Cowles, who was one of the pioneers in the aluminum industry. Be it that the Cowles brothers fell a little short of complete success in their early inventions and exploitations, or be it that they suffered chiefly from adverse patent litigation, the great honors and rewards went to Hall and Heroult. However, the work of the Cowles undoubtedly constituted important stepping stones in the development of the metallurgy of aluminum, and they failed to get the returns from their work that probably they should have obtained. It is, therefore, particularly gratifying that Alfred H. Cowles has now come forward with a new discovery of first-class importance, and it is to be hoped that this will become a great commercial success, will realize the dream of making aluminum mines out of many clay banks, and will reduce the cost of making aluminum by the 4 or 5c. per lb. that is estimated.

The Cunningham Claims

By order of the acting Commissioner of the General Land Office, the register and receiver of the Juneau, Alaska, land office, has placed on record the cancellations for fraud of the so called Cunningham coal claims in the Bering coal field. The lands now are a part of the public domain, and the $52,800 paid into the United States Treasury by the claimants is forfeited. The claimants may apply for a writ of mandamus in a District of Columbia court, but cannot appeal from the final decision of the Secretary of the Interior, dated Aug. 29, cancelling the claims. The money paid by the claimants cannot be refunded to them except by an act of Congress. Thus read the press dispatches of Sept. 13.

Secretary Fisher's decision, in part, is as follows:

> I have again reviewed the cases. No new considerations are presented in the argument, although it contains many statements, reflecting upon the animus and attitude of the commissioner which are, in my opinion, totally unwarranted. After full consideration, I am of the opinion that the findings of fact and the conclusions both of law and fact of the commissioner as expressed in his opinion in these cases, are correct, and they are hereby adopted as the findings and conclusions, both of law and of fact, of the department. The decision of the commissioner in each of said cases is affirmed. The applicants have had a full and fair hearing both before the commissioner and myself, and, indeed, the consideration by me of this appeal has in all respects also the effect of a rehearing of the case after my own decision. The decision will, therefore, be carried into immediate effect and the entries cancelled.

This will probably be the end of a famous case. The general public will rest with the belief that the Washington government checked the plans of a Morgan-Guggenheim syndicate to gobble a great area of coal land, whereof the value "ran high into the millions." A few persons only will know that the Cunningham claimants were men of substance and character, not dummies, that they thought that they were engaged in a legitimate adventure in connection with the development of Alaska, that their actions were in conformity with the laws of Apr. 28, 1904, and May 28, 1908, and that the government is in the position of disregarding its promises. Only a few persons, also, will know that the Bering coal field is regarded by experts as being of but slight value, and that the Cunningham claimants had no great commercial chances anyway. The climax of their misfortunes is reached in the confiscation of the $52,800 that they paid into the land office. The historian of the future desiring to know the facts of this controversy will turn to Mr. Winchell's paper in the JOURNAL of Apr. 23, 1910, and no doubt will conclude that Justice was not blindfold in this case, but wore blinkers.

The eighth International Congress of Applied Chemistry, the first to be held in the United States, was a success of which we may well be proud, and shows a truly remarkable world-wide interest in this movement. That the day of epoch-making discoveries is not over is shown by Bernthsen's lecture on synthetic ammonia, Eyde on nitrogen fixation as oxides, and Duisberg on synthetic rubber and similar problems. While the nitrogen lectures in a way touch the field of mining, in suggesting substitutes for our present nitrates, the general mining and metallurgical program was not showy. It was a record of great improvements made, but already known to the public, or of small improvements suggested. However, as Mr. Herreshoff remarked, one of the main pleasures of such a congress is, after all, not so much to hear the paper, but to see what manner of man has written it.

The offering of European spelter in New York makes this market a basing point and changes the differential that ordinarily exists between the New York and St. Louis markets corresponding to the freight rate. Imported spelter can be shipped to Connecticut and to such points west of New York as freight rates permit, but interior points continue to be supplied from St. Louis.

The high price for tin stimulates the use of aluminum as a substitute for it. Aluminum foil is now being extensively used in Europe for the wrapping of chocolate, tobacco, etc. One concern alone is reported to be using about 50,000 kg. per month.

By the Way

"The desert of Sahara, with its 6,000,000 square kilometers," said Giacomo Ciamician, of Bologna, at the recent International Congress of Applied Chemistry, "receives daily solar energy equivalent to 6,000,000,000 tons of coal."

One thousand tons of Japanese sulphur, valued at $50,000, was ablaze today in the hold of the British steamer "Fitzclarence," says a San Francisco dispatch of Sept. 12. Considering the liberal fire damages usually announced in press dispatches, it would be pleasing to have reporters adjust one's fire losses.

Chino is going to $60 or $65 and Butte & Superior to—. Thus runs the tip (private and confidential, of course). Also it is said that Chino's cost of producing copper will be nothing at all and that zinc will sell for 10c. per lb. The gullible may believe what they please and the lambs will continue to be meat for the bulls and bears.

The town of New Pine Creek is situated half in California and half in Oregon. A recent letter states that the saloons and mercantile houses are on the Oregon side, the mine offices and barber shops being in California. Apparently one can attend to the serious duties of mining and shaving in California, while for the frivolous "smile" one must cross the line into "Happy Oregon."

Another vibration of the old note comes from Canada. A prospector, so the story runs, in attempting to step ashore from his canoe, lost his foothold and slipped into the lake. In an effort to drag himself out of the water, he grasped at a convenient bunch of moss which was near the waterside. The moss stripped off the rock and disclosed—what?—why certainly, a vein of silver of marvelous richness. The prospector has samples to prove it.

A number of thefts of platinum from laboratories have occurred recently; as a warning to those responsible, *Science* publishes the following description of the thief: "A German Jew, with a German accent; age, about 40 years; height, 5 ft. 8 in.; weight, about 200 lb.; peculiar-shaped head; bald; clean shaven; large, short neck; heavy jaws; dark complexioned; dark hair and eyes; intelligent; when last seen wore blue-serge suit and panama hat, and represented himself to be a book and magazine agent."

A European contemporary calls attention to the copper mines of the world, stating that "North America alone, with its mines of New York, Maryland, Pennsylvania, Massachusetts, California, and above all, Lake Superior, furnished the world 527,000 metric tons of copper in 1911." Will Arizona, Montana and Utah kindly consider themselves put in their proper places, and not feel depressed by foreign recognition of their Eastern sisters, who are only "also rans" or scratched entries in the copper race.

There is a story told concerning Senator Cummins, of Iowa, who is known as an ultra-conservative. One of his acquaintances who knew of this made a bet that he would entrap him in a categorical statement, and one day pointed out a passing flock of sheep, "They've just been sheared, Senator?" Prolonged meditation —"Well, they do look that way on this side." That some such caution is necessary in mine inspections seems to be indicated by a dispatch from the town of Indiana, Penn.: "A few hours after United States experts had declared the mine nongaseous, one man was killed and two others were seriously injured by the explosion of a gas pocket in one of the Wharton Coal Co's. mines at Coral, Penn."

We do not anticipate a copper rush to Coronation Gulf or Victoria Land where Dr. Vilhjmar Stefansson reports finding a tribe of blonde Esquimos, supposed to be descendants of Norsemen who settled on the northern end of Newfoundland about 800 years ago. According to preliminary dispatches, "they use bows made of willow bound together with sinews, and their arrows are tipped with flint and native copper, which is pried out of ledges or found in stream beds on the mainland. Their knives are made of copper with horn handles, in much the same manner as implements were made by the early Norsemen who settled on Greenland." As a mining report, the account is wanting in detail, but copper doesn't start rushes in these days. Greenwater is the last one we remember and hardly anybody hears of that now, except when Greenwater Copper Mines tries to dispose of its surplus and examines a new property.

Those who have brought mining propositions to New York and gone "broke," waiting for capitalists to snap up their brilliant prospects, are legion. Every engineer has encountered them and sad to say there is but little diminution in the steady stream of those who think that New York money is restless to get away from the safety vaults into undeveloped mines. In James Montgomery's buoyant comedy "Ready Money," now playing at Maxine Elliott's theatre, the hero, *Stephen Baird*, has sunk his all in a gold mine that has refused to develop. All his pals, his fiancee and her family are preparing to see the old year out, but *Baird* refuses to participate. On Jan. 2, if he cannot find $20,000 to pay a note he must lose his mine. While his friends are indulging in high jinks downstairs, *Mr. Jaekson Ives*, a gentleman who wears an ermine-lined coat in the easiest sort of a way, drops in on young *Baird* to pay a New Year's call. Not only is *Mr. Ives'* overcoat fur lined, but his heart seems to be bursting with generous intentions and all his pockets are stuffed with thousand-dollar bills. He offers to loan *Baird* as many as he wants, but after he had handed over a roll of them to the young prospector he mentions the fact, incidentally and with an air of pride worthy of an artist who has just turned out a masterpiece, that the bills are all forgeries of his own creation. He is so well known, however, that he can no longer put his own money in circulation. He proposes that *Baird* shall do this little service for him on a 50% basis. *Baird*, being the hero of a modern comedy and consequently almost abnormally honest, refuses indignantly, of course. Then *Mr. Ives* assures him that he needn't pass the money; if he will only flash the bills in the eyes of his friends and agree to give *Ives* half of the real money which the mere sight of the bogus roll will produce, the counterfeiter guarantees that they can both make an "honest" fortune. *Baird* agrees to do this for a single day just as an experiment. The result makes the play which Acton Davies reports as a rattling little comedy, as clever as it is amusing, and one that has already panned a pay streak in London and Chicago.

Some months ago we chronicled the departure from St. Johns of a gold-hunting expedition to Baffin Land and other points in the Arctic Circle. Two ships were outfitted and a rival overland party was also reported to have started about the same time from Cobalt for Ungava, which was then the assumed destination of the "Algerine," an old British gunboat, which left St. Johns in June, in command of Capt. John Bartlett; the "Neptune," commanded by Capt. A. W. (Lucky) Scott, sailed a few weeks later. Dispatches now announce the return of the "Neptune" to St. Johns on Sept. 15, Capt. Scott reporting the loss of the "Algerine" in an ice pack, the discovery of extensive coal deposits, but no gold. The "Neptune" brought back the crew of the "Algerine," two tons of ivory, 60 bear skins, one muskox and a live polar-bear cub belonging to S. Osgood Pell, of New York, who accompanied the party. From which it may be deduced that the expedition was not as fruitless as some prospecting trips have been. When the "Neptune" reached latitude 74° N., the ice field became so massive that Captain Scott decided to turn back. The "Algerine" was crushed by ice in Pond's Inlet, and sank in 35 min. The crew walked 40 miles over the floes to land, where they found a cache. For two weeks they subsisted on four crackers per day, working their way to Button Point, 70° N. latitude, where they succeeded in signaling the "Neptune" as she was passing.

The Situation in Chihuahua

CHIHUAHUA CORRESPONDENCE

During the last 30 days, mining conditions throughout the state of Chihuahua have generally improved, first on account of the dispersion of the rebel forces from the larger settlements and the subsequent reëstablishment of railroad traffic on the National and Mexican-Northwestern lines into Chihuahua. At places in the western part of the state and remote from railroads, however, operations have been harassed by the marauding bands of rebels, who have looted mine stores, robbed and maltreated both foreigners and Mexicans and even compelled the shutdown of some of the larger mines, such as the Dolores, Concheño and Yoquivo. At these, as well as at other mines, advantage is being taken of the enforced situation to make a general overhauling of mine and mill plants, with the expectation of running at full capacity within 30 days or so, by which time it is anticipated that the roving rebel bands will have been driven into the adjoining state of Sonora or maybe run down by the federals. The main losses, other than such as are attendant on the forced suspension of operations, have been in store stocks and firearms, sufficient care having been taken in most cases to send out or conceal all bullion before the appearance of the thieving bands. In several instances, however, money was paid over to the marauding chiefs under threats of property or personal injury. Foreign companies, which are the main operators, suffered most from these predatory bands. It is not anticipated that there will be a repetition of these outrages on account of the nearness of the federal soldiers, who are in as close pursuit as permissible with their inferior knowledge of the country.

Prior and since the evacuation of Chihuahua by the Orozco forces, the Chihuahua plant of the American Smelting & Refining Co. operated uninterruptedly, inasmuch as an abundance of ore was obtained locally and the supply of coke and coal was ample. The Rio Tinto smeltery, at Terrazas, however, was forced to suspend for about 40 days, on account of fuel shortage, but is again in commission.

Operations must be more or less hampered for some time on account of uncertain railroad traffic, resultant first from the wanton track and bridge destruction of the retreating rebels, and second by subsequent heavy rains. The National line is open to Torreon and Parral, but it will require at least two months for establishment of service between this city and El Paso. The Mexico-Northwestern Ry., however, is operating regularly from Chihuahua to El Paso, via Madera. Owing to the temporary repairs and the generally bad condition of the roadbeds, traffic is more or less irregular and the movement of heavy trains is impracticable at present.

Activity in the Parral and Santa Barbara camps is confined to a half dozen of the larger producers, such as Minas Tecolotes, El Rayo, Alvarado, Moctezuma and San Francisco del Oro. Work has been resumed at the Indé and Guadalupe mines, in the Indé camp, in Durango, but very little activity is reported from Guanaceví. Both of these camps are best reached from Rosario, on the Parral branch of the National Railways of Mexico.

The Cusihuirlachic camp has been remarkably free from trouble, except the impossibility of shipping its ores on account of lack of railroad facilities. The development activities continue uninterruptedly.

A few investors, particularly English, are taking advantage of the present lower prices asked for meritorious properties, and it is likely that a number of transfers will be shortly recorded from several camps. Donald B. Gillies and associates are reported to have acquired several heretofore productive mines controlled by the Terrazas-Creel interests, and in fact work has already been started on one, namely, the Magistral, about 25 miles west of Chihuahua. Mexicans in particular are offering properties at greatly reduced prices.

An important Federal ruling was to the effect that mining taxes paid to the revolutionists during their control of Chihuahua affairs need not be paid a second time to the Federal authorities, and of the extension of the final limit of payment to Oct. 1. Prior to this ruling there was considerable anxiety among mine owners, who feared that the payment of these annual taxes to the rebels might be no bar to their second payment to the constitutional government.

Rebels at El Tigre

Mexican rebels under the command of Inez Salazar, captured the town of El Tigre, in Sonora, after two attacks, Sept. 15. While the rebels were attacking the town, a detachment of federal troops was within a distance of nine miles, yet made no effort to aid the garrison that was eventually driven from the place.

The rebels looted the store of the Lucky Tiger Combination Gold Mining Co. and, according to the dispatches, departed with 21 bars of bullion. A threat was made to hold L. R. Budrow, general manager, R. T. Mishler, assistant manager, and H. L. Nix, manager of the El Tigre Merchandise Co., as hostages for a $100,000 ransom, but it was not carried into effect. The federal troops returned to the town after the rebels departed. Telephone communication was restored long enough to announce that no American had been killed or seriously hurt. Later dispatches state that Consulting Engineer James W. Malcomson, of the Lucky Tiger company, has offered a reward of $5000 for the recovery of the stolen bullion. Automobiles were being sent into Sonora to bring out the women and children of Nacozari who were to come by train as far north as the condition of the railroad would permit.

Southern Aluminum Co.

The Southern Aluminum Co. (cf. ENG. AND MIN. JOURN., June 22, 1912, p. 1212; Sept. 7, 1912, p. 453) organized to manufacture aluminum and its byproducts and to operate in the State of North Carolina, with principal office in New York City, has been incorporated with a capital of $6,400,000, of which $4,000,000 is to be 7% cumulative preferred stock. In addition, the balance of the net profits is to be divided equally between the preferred and the common stock.

The directors are Adrien Baden, Leon Bartholin, George Bergès, Hippolyte Bouchayer, Henry Brunner, Charles Dubreuilh, Jules Dreyfus and Charles Michel-Côte, of Paris, France; Hubert Chalmeton de Croy, of Lorette, France; Henry Gall, of Versailles, France; Jean Sonnery-Martin and Lazare Wolff, of Lyons, France; Zachary Hochschild, of Frankfort-on-the-Main, Germany, and Dr. Paul Heroult, of 149 Broadway, New York.

Western Phosphate Field

The phosphate field of Idaho, Montana, Utah and Wyoming, most of which belongs to the government, is the largest ever discovered in the world, according to the U. S. Geological Survey. The exact boundary of the phosphate-bearing area is gradually being determined by detailed and reconnaissance examinations, and the original tract of 4,541,300 acres, withdrawn Dec. 9, 1908, as a phosphate reserve, has been altered from time to time by the restoration of nonphosphate areas and by additional withdrawals. On Sept. 1, 1912, the outstanding land withdrawn in this general region amounted to 2,211,867 acres.

U. S. Geological Survey Appropriation

A total of $1,477,920 was appropriated by the last Congress for the use of the U. S. Geological Survey for the fiscal year ending June 30, 1913. The principal items are: Topographical surveys, $350,000; geologic surveys, $300,000; mineral resources of Alaska, $90,000; mineral resources of the United States, $75,000; chemical and physical researches, $40,000; geological maps of United States, $110,000; gaging streams, etc., $150,000; surveying national forests, $75,000.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Selling a Mine

There has appeared from time to time so much advice to prospectors and vendors of mines and prospects—well, not prospects; investors do not want these; prospects never made a mine, you know—that it may be interesting to look at the situation through the prospector's or vendor's eyes for once and the following letter prompts me to send this to you, with little comment.

The suspicion gains ground in the West that the kind of stuff that has been so persistently forced on the reader for months past, has been written from a well cushioned chair and, in many cases, by writers who know not the life of the prospector, and whose days have been since all the big mines of the country were prospects, and who have forgotten that they themselves once were babies without an original thought in their heads.

The prospector reads the technical papers; the development of his mines makes business for the machinery man and advertising for the paper. He, therefore, has some rights to be heard in the way of advice to the investor. The kind of stuff that has been appearing has an adverse influence on the industry in many ways. It is discouraging to the prospector, to the legitimate vendor of partially developed mines and prospects; it has influenced the less thinking possible small investor in prospects and leaves the field, as far as this influence is felt, to a class of investors whose desire seems to be to dictate all terms and conditions.

The experience of the prospector given below is common and the sentiments he expresses are gaining ground throughout this section and will bring about a condition that can mean only continued setback to the advance of a legitimate and highly profitable industry.

Not the least objectionable feature is that referred to in the remarks on "that kind of engineers" in the letter.

I commend the following letter to the attention of your readers and to investors in particular.

VENDOR.

Creede, Colo., Sept. 7, 1912.

Dear Pard:

Another glittering dream vanishes with the dawn, the deal is off and yours faithfully is a wiser if not richer "tenderfoot." I say "tenderfoot" in the light of looking backward, we of the pick and shovel are kids to these wise finance men of the east—give me the western mining man to deal with, they are on the square at least. I have been reading how we should not ask money down, should have ore "blocked out," "in sight" etc., etc., and much other good advice to you and me and the rest of the boys as to how to sell a mine, how we must have a lot of mineral showing in the camp and all sorts of dope, and in the papers that we look to for information, supposed, and finally made up my mind that it was coming so strong that there must be something in it. I had a chance to make a turn so concluded I would give them a chance and see how it worked. All was lovely, believe me, they got busy, I had a chance to do business with some good home people but was tied up, I had asked nothing down, nothing mind you, for the privilege I gave them, and, to make a long story short, they dumped me, side tracked by a bunch who thought they could land me for less and one thing and another, as I found out after.

Right here I want to tell you that we have some rights in this business of tieing up our ground and the next geezer that wants a lay, will plank down enough coin to show his good faith in the deal, then if he wants to drop it and thinks he can come back on a smart 'horse trading' stunt, I will have something for the time I am idle, the delay and possible loss of other chances to make a deal. I understand that when they want stock on option, they pay something for it but they use the papers to tell us what hardships we are putting on them, if we ask a small forfeit.

This ain't the worst feature of the deal I had up, as the following which came to my hand later will show you, and you might have use of the advice for your own use. This came pretty straight. "There are two ways to deal with that kind of 'engineers!" I am told, "one is to hand them a slice of the commission, the other is to hand them a swift-kick somewheres! I think one could hand him first the last and then the first and he would forgive you for doing it!?"

Tuck this under your hat and size up the "expert" when he comes along. If he wants 'the bullion on the dump with the eagle stamped on it,' waste not your valuable time with him, he knows not a mine.

With Everlasting hope, here's to the future,

Yours,

Bill.

Efficiency Underground

Many articles have been written in the last year on the question of efficiency in underground mining operations; for instance, there is one by P. B. McDonald in the JOURNAL of Oct. 28, 1911. It has occurred to me that a description of conditions in a certain Western mine might be interesting—especially when written by a miner.

The mine in question is a low-grade quartz gold mine hoisting 300 tons per day, and the miners are all Europeans, over half are Spanish, and over one-quarter are Italians. The labor is satisfactory, but through poor management and lax supervision the results are not nearly what they might be.

As an instance of poor management, the mine is worked by shrinkage stoping, and yet in order to keep the stamp mill going, the one large stope of the mine is drawn down so much that high stagings are nearly always necessary to drill the back. I have worked on a stage 25 ft. high, and 16 ft. is common. It is difficult to bar down all the loose ground in such a stope, and this with the fact that the hanging is inclined to slab off, and is sometimes a little wet, makes it bad. In a year one man was killed and four were badly hurt as a result of not keeping the stope full in the ordinary way. Much time is spent in building the high stages necessary, and these ordinarily must be moved back on the night shift to provide sufficient drilling ground for both shifts as two to four men work on each stage, and the ground is not hard. Ingersoll BC 21 and Waugh stopers are used. Personally I know that when I do not need to build a high stage, I am able to drill 25% more than otherwise. Some staging is needed, of course, as the muck is always lower on the hanging side, but a low stage is quickly made. The high stages are the result of a mistaken policy—that of keeping the mill going at all hazards.

Supervision is lax, especially on night shift. On day shift there is a foreman, a shift boss, and a stope boss. Although there are only four or five different working places in the mine, the night shift boss seems able to visit them only twice, once before supper, and once after, usually about 11 o'clock. One or two men usually stop work after his second visit and soon all are "tapering." Of course, some time is needed to remove machines, hose, air pipe, etc., to a place of safety, but all

that is usually done by 11:30, often earlier. For months I have thus seen 10 to 12 men quit work from one to 1½ hr. before the end of the shift; it is a custom now. On day shift a half hour is lost in the same manner, corresponding to the time at which all the bosses leave the mine. There is a considerable loss of efficiency here, it seems to me, through time lost or wasted by labor. Labor at this mine forms about 60% of the total operating expenses.

During the time I have worked at this mine there never has been enough drill steel, and when new steel is purchased it is cut into lengths with no regard to the fact that certain lengths of drills are abundant and certain other lengths are scarce. The steel for each shift is sent down, after the men, who have to come to the station for it, and often then have to wait for it. Every shift, at least one-half hour is lost from actual drilling, in packing steel into the stopes. One nipper handles the steel, and necessarily he leaves much dull steel in the stopes at the end of the shift, as usually two to three hours drilling is done after his last collection of steel. The employment of two nippers on each shift, and the purchase of more steel would permit all the drill sharpening to be done on day shift, thus saving in the wages of the two sharpeners at night, and in power and fuel.

There is always a scarcity of tools such as picks, bars, wrenches, etc., and picks when sharpened are not sent down with the drill steel. Each man when he wants a pick takes it with him when he gets into the skip. There is little doubt that many tools are lost temporarily at least, in the stopes, which are never level, one end always higher than the other. The disadvantages of such a stope have been pointed out in a recent article.

At one time, small oil flasks were furnished the miners but this was not kept up, and now less than half of the men have any means of oiling their machines. A stoping drill needs oil regularly, especially after it has been used for several years. On account of a lack of system, machines when out of order, are sent to the shop on the surface with no note or record of the trouble, and many of them are sent back with no repairs made. Usually the packing is not examined, and a stoping drill with loose packing is enough to ruin the disposition of an angel, besides hindering a man in his work.

There are no spare pipe fittings or pipe kept underground. More than once I have lost from three-quarters of an hour to an hour by being compelled to take a hose to the shop because the union on the end was worn out; on other occasions I have spent as much time looking for a length of old pipe, or a pipe wrench. Extra hoses and machines when repaired are left in the shop, instead of being sent down where they will be needed.

The miners are required to report the holes drilled. In case a man has hard luck, machine out of order or the hose in bad shape, he still feels that he ought to report the usual number of holes, and so he drills the usual number, but makes them shallow. Two men are employed on the "graveyard" shift to blast almost all the holes, and these men could report the number of holes, if desired, though as a matter of fact, the foreman does not make any reports to the superintendent concerning the number of holes drilled, or in fact anything else.

The men employed to blast the holes save the mine a large amount on the powder bill—not less than 10 cases of 40% gelatin per day, over the old arrangement of having the miners blast their own holes. However, the blasters do not cut the fuse and depend upon rotation of spitting to secure rotation of blasting. Many missed holes result, and although they go back and shoot these over, the result is not good.

The above applies to miners. As I worked for three months as a mucker at the same mine, I can speak of the conditions in mucking. There is a poor track arrangement on the main level. The station chute holds 150 tons, and yet when a man brings a car out to the station, he must wait until the man ahead of him has dumped his car, cleaned off the track, and pushed his car ahead, after which he dumps his own car, the first man then resting until the second car is dumped and the track again cleared.

At the chutes "grizzly" men bulldoze the boulders instead of blockholing them, which means more powder used, and more smoke to hinder the work at the chutes. The cars are made at the mine, and have old-fashioned loose wheels and axles. Much oil is wasted, as the cars must be oiled twice a shift, and much oil gets to the stamp-mill as there is a little water in the ditches beside the track. The drifts are narrow, and before many of the stope chutes there is not sufficient room for a man to work comfortably when filling cars. In driving the drifts, the laying of new track is done by the muckers that happen to be there, and as the work is generally done near the end of the shift, when the boss has already gone up, the work is not properly done, and as the track is in constant use it is never relaid. I never saw a rail splice in the mine.

Nearly every one of the things that I have mentioned is small in importance in itself, and yet I am sure if corrected, would cut down the mining costs, or else would allow a greater production with the same number of men. But after all, it is nobody's business, for I happen to know that the management is considered satisfactory by the owners.

"Where ignorance is bliss —."

A. MINER.

Ninguna Parte, Ariz., Sept. 1, 1912.

Grinding Samples for Assay

The article on p. 446, of the JOURNAL of Sept. 7, 1912, "Grinding Samples for Assay," seems to require considerably more explanation than is there given. In his article "The Preparation of Assay Samples" (ENG. AND MIN. JOURN., June 24, 1911,) L. D. Huntoon remarks, "I prefer assay pulps pulverized through 100-mesh to assist in the furnace work, but not for the accuracy of results, providing the fashions are made properly."

In the last phrase seems to lie the key to the whole matter. It is, as Huntoon points out, absolutely necessary to run by slow fusion and to pour at a high heat on 60-mesh ores. From the article in the Sept. 7 JOURNAL, it is impossible to tell whether or not these conditions were complied with, but until information is given on this point, it seems rather premature to make the bold statement that ores ground to 60- or 70-mesh generally give low results.

It also seems that it is not enough to say that in finer grinding large quantities of foreign matter are introduced, and low assays laid to that. This can be tested by determinations on metallic iron. As a friend recently wrote me, "I find it possible to introduce ½ to 3% of extraneous iron into my samples, depending on the hardness of the ore and the energy of the Mexican employed," but it is easy to determine such external matter. (I might state here that in my own work I have cut down such introduction materially by using chrome steel mullers and bucking boards).

In short, it seems to me the article in question is "Hamlet" with the Dane omitted, and that considerable further enlightment should be afforded us on these Mexican experiments.

T. T. GRAY.

Perth Amboy, N. J., Sept. 9, 1912.

Consumption of Sulphur

I have noted with great interest the remarks on the Newberry-Fishburne calcined-phosphate process and its possible effects on the acid trade of the United States in the late JOURNALS, and thought perhaps the general run of readers might view a remark of Utley Wedge today at the Chemistry Congress with the same interest I did. It was to the effect that the uses of sulphuric acid were constantly on the increase, and instanced that the next few years would undoubtedly see a great consumption of sulphuric acid for making ammonium sulphate at regenerative coke ovens.

Perhaps by the time one branch of the fertilizer industry is through with sulphuric acid, another may be using equal quantities.

A. A. NASON.

New York, Sept. 10, 1912.

Aluminum from Clay

A process, developed by Alfred H. Cowles and the late Adolf Kayser, permits the use of cheap clays to produce a substitute for bauxite; it is claimed that with the utilization of byproducts the cost of aluminum production will be cheapened by 4 or 5c. per lb. Clay and salt are treated with steam to produce hydrochloric acid and sodium silico-aluminate. This is then broken down by lime into calcium silicate and sodium aluminate, from which cement, soda and alumina are made.

Note—Slightly abridged from a paper, "Alumina, Hydrochloric Acid, Alkalis, and White Hydraulic Cement from Clay, Salt and Lime," read by Alfred H. Cowles before the International Congress of Applied Chemistry.

Since 1862, or earlier, the proposal has been in the literature to produce hydrochloric acid and potassic or sodium compounds from salt and clay by passing steam over the mixture at a high temperature.[1] These proposals have been condemned as impracticable by Thorp's Dictionary, Lunge and other high authorities.[2] It was not until 1902 that a method was patented by Adolf Kayser to separate the silica effectively and economically from an alkali-silico-aluminate formed as one product in the above process.[3]

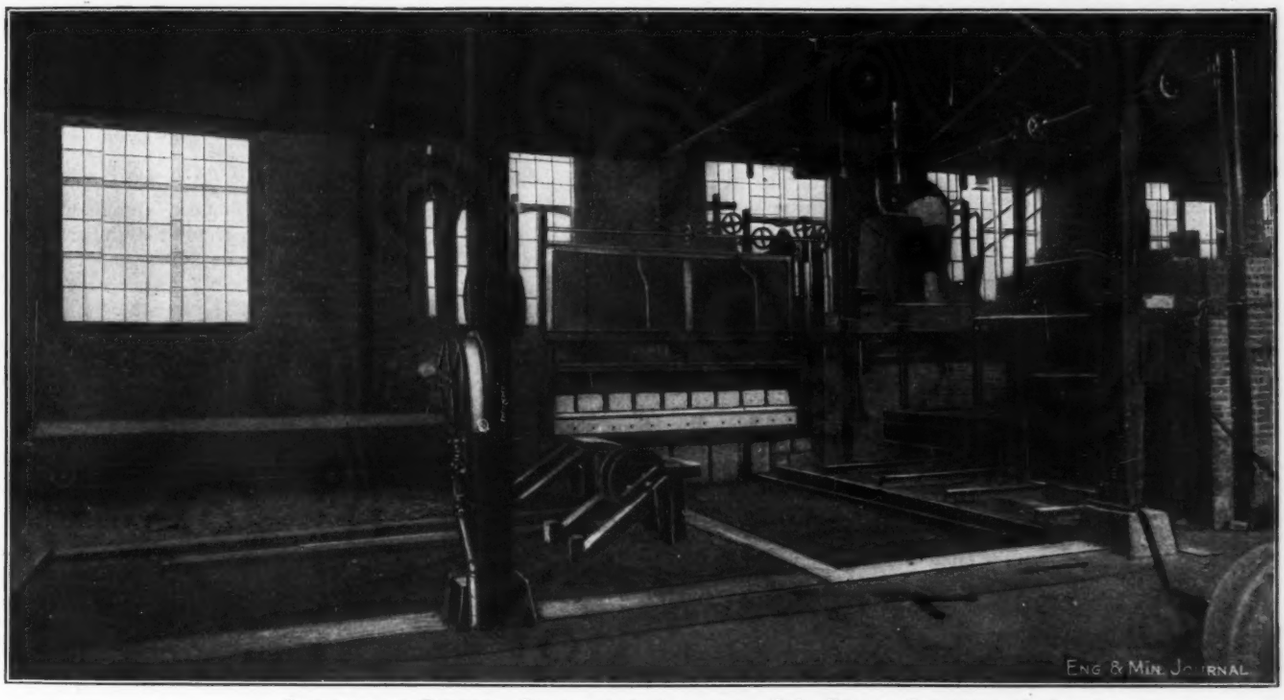
Cause of Early Failures

The attempts to render this process a commercial success, resulted in failure for this reason: If most clay and salt alone be mixed together, molded in the form of perforated briquettes, and after drying, be heated to a good red heat, but not high enough to melt the final product; and water vapor be passed through the mass, a chemical action begins on all surfaces of each heated briquette. The water vapor gives oxygen to the sodium of the salt, and hydrogen to the chlorine, thus hydrochloric acid passes off as a vapor, while sodium monoxide combines with the silica and alumina of the clay, forming sodic-silico-aluminate. This action slowly passes inward from the surfaces of all heated briquettes. The conversion of the material from the outer surfaces inward is slow. Kayser, in the '90's, found that it took 72 hr. for the change to penetrate through a briquette wall, from its two sides, that was scarcely more than one-half inch in thickness, and this in a furnace capable of containing many tons of such material. His briquettes had a crystalline structure. Though shrunken some, they retained their molded form.

The result of this slowness of action involved a too long heating of the briquettes, necessitating an abnormally large volume of nitrogen and fuel gases passing through the furnace to effect the result. The quantity of these inert gases was so great, that the hydrochloric-acid fumes evolved were not capable of efficient and practical condensation.

Making the Briquettes Porous

While Kayser was employed as a chemmist with the Electric Smelting & Aluminum Co. of which I am president, I suggested that we make up some salt and clay briquettes, adding charcoal or sawdust to the mixture to render them porous during heating; and compare them with similar briquettes of clay and salt alone such as he had formerly used in his attempts to render the process mentioned commercial. He did not think this mixture would work, as he was positive that it would destroy the oxidizing atmosphere needed in the operation to prevent the formation of volatile aluminum chloride (Al_2Cl_6). I believed that an oxidizing atmosphere was only necessary around the briquettes, and that it would gradually penetrate the mass of each briquette, and that a reducing atmosphere at interior portions of such briquette could not interfere with the desired reaction, as any



Interior of Electric Smelting & Aluminum Co's. Plant, Sewaren, N. J.

[1]Brit. pat. No. 2050 of 1862 of William Gossage. Brit. pat. No. 2679 of 1874 of Herman Gruneberg and Julius Vorster. A number of American patents to Adolf Kayser between the years 1886 and 1896, also English pat. No. 11,492 to Adolf Kayser.

[2]Lunge, Vol. 2, p. 429, 1895 Ed., "Heating sodium chloride mixed with clay in a current of steam, according to Vorster and Gruneberg, produces sodium silicate and steam (?). The temperature is so high and the wear and tear of the apparatus so great, that this process is not practicable." Thorp's "Dictionary of Applied Chemistry," Vol. 3, p. 454. Referring to the attempts of Gossage (1862), Gruneberg and Vorster (1876) and Lieber (1878), states that the temperature required for the decomposition of salt is too high and the vessels employed cannot be made to last, and on these accounts the attempts had no practical results.

[3]U. S. pat. to Adolf Kayser dated Sept. 5, 1901. Issued Sept. 9, 1902.

aluminum chloride formed, would of necessity, change to oxide before leaving the briquette. Without mentioning this to Doctor Kayser, I insisted upon the trial being made. The bricks containing charcoal were converted into sodic-silico-aluminate in one-ninth of the time that was required with like briquettes containing no charcoal, and acid of 17° Bé. was condensed with a small apparatus in the face of imperfect control.

This experiment opened up an entirely new vista of success to the process. It meant that the volume of fuel gases and nitrogen necessary to pass through a charged furnace would become so reduced, as to permit of efficient commercial condensation of the hydrochloric acid evolved. It meant a great saving of fuel, and far greater capacity of output with the same cost of plant. Dr. Kayser and I became equally enthusiastic. Our company acquired his patent for opening or rendering soluble the alumina in the form of sodic-aluminate from the sodic-silico-aluminate briquettes produced, and after two years or more of added experimental work in the laboratory, a large plant has been erected at Sewaren, N. J.

The Commercial Process

The process as a whole is easily understood. The clay, carbonaceous matter and salt are made into perforated briquettes, and after being kiln dried, are passed on flat cars through a long furnace of the tunnel type, which brings the briquette to a temperature of about 1035° Centigrade.

Knowing the composition of the clay, and the percentage of salt in the mixture, steam is blown into the discharge end of the furnace over a train of cars covered with firebrick, with their iron parts sealed off, while through a vestibule at the other end of the furnace, loaded cars are gradually pushed forward by a hydraulic pusher whose speed is under control. The weight and composition of the material on the cars thus fed into the furnace is known, and the correct proportional weight of exhaust steam is passed into the furnace from the opposite end. From the charging end, the gases at a temperature too hot to attack iron, are sucked by a large blower and forced through a large hydrochloric-acid condensing system. The temperature of the furnace is controlled by oil heat and measured by pyrometers. Most of the heat required is furnished by the carbonaceous material mixed with the clay and salt of the briquettes. The reaction that takes place will vary according to the composition and mixture of the aluminous material and the salt, but typically, the final reaction is as follows:

$$Al_2O_3\ 2SiO_2 + 4NaCl + 2H_2O + yH_2O + xC + xO = (Na_2O)_2\ (SiO_2)_2\ Al_2O_3 + 4HCl + yH_2O + xCO.$$

The surplus water vapor and the hydrochloric-acid gas are carried into the condensing apparatus and are condensed. The briquettes maintain their original form as the cars bearing them are gradually pushed out of the discharge end of the furnace, having been cooled by the inflowing rush of measured steam and a limited quantity of air.

The sodic-silico-aluminate briquettes formed have been made containing as high as 33% of sodic oxide. The above reaction would give 35.8% Na_2O. There is no appreciable loss of salt. While pure clays are preferred, all small amounts of iron pass off as iron chloride with the hydrochloric acid and are condensed with the first hydrochloric acid in the first condensers of a multiple system. The acid produced is remarkably pure, free from arsenic, and but traces of sulphuric acid can come from iron pyrite if the same be in the clay. When briquettes are made containing 32% of sodic-oxide, the output of 30% hydrochloric acid should be about 1½ tons of acid to one ton of salt and clay in the charge.

Breaking Up the Silico-Aluminates

The next step in this process is, to open the sodic-silico-aluminate, which is acid, to secure from it the sodic aluminate which it contains. This is accomplished by heating a mixture of the ground acid salt with just sufficient lime to combine with the silica in it and form dicalcium silicate.

$$(Na_2O)_2\ (SiO_2)_2\ Al_2O_3 + 4CaO = 2(CaO)_2SiO_2 + (Na_2O)_2 + Al_2O_3.$$

Limestone, calcite or marl in their chemical equivalence to lime may be used instead of anhydrous lime.

In the reaction just given above, any amount over two molecular weights of calcic oxide to each molecular weight of silica, leads to formation of insoluble calcic aluminate, and less than two molecular weights, is not sufficient and leaves undecomposed sodic-silico-aluminate. In each of these cases, marked loss in the recovery of alumina may occur. The mixture of lime and the acid salt is heated in a rotary cement furnace, or in a furnace of the tunnel type as above described, just to its clinkering temperature. After its discharge from the furnace, it is broken into fragments and these are in an excellent physical condition for effective leaching. Nearly all the sodic aluminate may be leached from this clinker, while there is left behind a white mass of dicalcium silicate containing some sodic aluminate. Having secured the sodic aluminate in solution, the method of procuring the alumina and caustic soda therefrom is that already in universal use.

Manufacture of Cement

The residue of dicalcium silicate when heated in a cement furnace with one molecular weight more of lime gives a clinker that conforms in composition to Newberry's formula for the best and strongest hydraulic cement, but it has the advantage that all of the iron oxide has already been removed from the silica that goes into its composition, thus rendering it easy to secure a white cement by the use of limestone free from iron. Such cement sells at about four times the market price of ordinary cement.

This process opens the way to secure the alumina cheaply, or as a byproduct in conjunction with these other products, of great consumption in the industrial arts. There is required 1.9 lb. of alumina to produce 1 lb. of aluminum by the present method of manufacture. This costs 6½c., and is the heaviest item of cost in producing this metal. By the general introduction of this process, we may hope to see the cost of production of the metal aluminum reduced 4 or 5c. per pound.

This process also furnishes a key to unlock the stores of potash from the world's mountainous masses of potash feldspar. As one way to do this effectively, the feldspar should be ground and mixed with either chloride of sodium or chloride of potassium and made with some clay and sawdust into the form of briquettes, then passed through a furnace under conditions similar to those described above. The solid product should then be submitted to Doctor Kayser's lime-opening process. The clinker on leaching gives potassic aluminate or a mixture of this with sodic aluminate from which the alumina may be separated, and the potash or potash and soda secured for use in fertilizers. The residue from leaching can then be converted into hydraulic cement.

A study of the reactions herein given in connection with the volatilizing temperatures of the various chlorides of the common metals will throw much light upon the geological theories of formation of intrusive mineral veins.

Before closing this paper, I wish to express my pleasure at being able to do homage to Mr. Kayser and make known the splendid work of an able, enthusiastic, genial chemist, without whose aid the above described process as a whole, would never have attained the completeness that it now has, and the great usefulness that future years will confirm.

Discussion

Answering various questions as to the process, Mr. Cowles said that no attempt had been made to utilize the CO, but this may eventually be done as CO is utilized from blast furnaces. To remove small amounts of HCl from it, it should be passed through a proper scrubber.

White cement has high value for use in decorative work, although so far we have only made the dicalcium silicate. By adding one molecular weight of CaO to the same we know that we fall within the formula discovered by Arthur Newberry for the strongest hydraulic cement, which

formula permits up to several per cent. of Al_2O_3 to be present in tricalcium silicate, and if iron oxide be absent this produces a strong white cement.

The reactions have been worked out on a large experimental scale during three years work previous to our starting to erect our plant at Sewaren, N. J. I expected to have here this morning converted briquettes from a channel furnace 184 ft. long, the first from the new plant; but yesterday morning an engine cylinder that operated our generator went to pieces. This stopped the furnace with the bricks just approaching the hottest zone in the furnace. Acid was condensing in our condensing system at this time.

Any Volatilized Salt Caught by Incoming Charge

The NaCl is decomposed by superheated steam before it has a chance to distill off. Some will vaporize in the hot zone of the furnace and be carried over the loaded cars. For about 90 ft. the hollow briquettes act as a scrubber and carry the sublimed salt back toward the hottest zone of the furnace. Using too high a percentage of NaCl in the briquettes might clog the furnace, for it would be capable of forming more Na_2O than the clay would be able to absorb. The limit above that required to place 33% of Na_2O in the product will probably be higher with our large furnace than with the small furnaces that we formerly employed.

The reaction begins lower than the vaporizing temperature of salt. Day before yesterday the hottest part of our large furnace was 1450° F. and acid fumes so strong were passing through our condensing pipes that it was with difficulty that U-shaped pipes were connected between one set of upright acid ware pipes to permit the fumes to pass through other sets, and weak acid was drawn from the condensers. After we pass the vaporizing temperature of NaCl, about 1700° F., the reaction goes on rapidly. The higher the Al_2O_3 in the clay the higher can the temperature be carried without melting the briquettes.

The purer the clay the better, as the presence of iron oxide leads to a larger amount of iron chloride and loss of pure acid. If the iron chloride were used for leaching ores or otherwise, then its presence would not be so detrimental. The Moraine clays contain an undesirable amount of iron oxide, and are most too low in alumina for best results.

On Sept. 4, the 55,000-bbl. tank No. 1, of the Associated Pipeline Co., in the Lost Hill district, California, was destroyed by fire, the loss being about $40,000, which includes 21,000 bbl. of petroleum. About an equal amount of oil was saved by being turned into a near-by creek.

Mining at Fairbanks, Alaska

Special Correspondence

In general, Fairbanks is enjoying a prosperous year. The output from the placer mines will not fall far short of the figure for last year, when it was about $4,000,000 for the Fairbanks district proper, or $5,000,000 for the entire Tanana Valley. The output of lode gold will be approximately $300,000, as against $60,000 for the year 1911.

At the workings of the Newsboy Mining Co., at the head of Cleary Creek, the mill has been running steadily since May 17 on ore that has returned from $10 to $20 per ton. Early in the season a pumping plant was placed on Willow Creek, 3000 ft. from the mine, to furnish water for the mill. This has been operated only when the supply of water by gravity ran short. Plans are now under way for removing the mill from the mine to Cleary Creek near the junction with Willow Creek. It is hoped that sufficient water can be developed here to continue crushing operations throughout the winter.

In the mine, the shaft is 350 ft. deep. Drifts have been driven on the 115-, 215-, and 315-ft. levels, and stopes have been operated from the upper two. The vein ranges from one to six feet in width. Assays and mill returns show a variable gold-content and an extremely erratic distribution of the gold. Some of the ore is free milling, while some carries too much stibnite and arsenopyrite to be suitable for stamp milling. The tailing is reported to assay as high as $8 per ton. The present outlook for this property is not bright. There have been financial troubles and several changes of management. George Hallock, a graduate of the University of Washington, is now in charge.

McGillivray and Fisher, lessees on the Newsboy Extension, have recently completed the installation of a boiler, a hoist, and a mill of five stamps. The shaft is down 120 ft. Drifting is in progress at 60 ft. and at 115 ft. It is probable that this property will be closed down during the winter months.

At the Tolovana mine on Willow Creek, a 2-stamp Nissen mill is being installed, in place of the Huntington mill that has been in use for the last year. The mine is developed by adit and by winzes, and there is said to be a large body of good ore available for extraction.

The Rhodes-Hall property, on Bedrock Creek, is the banner quartz mine of the camp. The 5-stamp mill is operating steadily on ore milling from $40 to $200 per ton. Many of the weekly cleanups are reported to exceed $10,000. The mill, which is in charge of Alan Cunningham, has been remodeled and is now working smoothly. A recent shipment from San Francisco for this property included a dynamo, an electric hoist, an electric pump, materials for an electric-lighting system, and supplies of all kinds sufficient to last the mine a year. In the mine, ten stopes are being worked. The main adit has been connected by a raise with the surface. A large station has been cut 800 ft. from the entrance of the adit to accommodate the hoist which will be used to deepen the winze at this place.

William Burns and associates recently purchased from Fey and Jesson a group of 17 claims at the head of Chatam and Fairbanks creeks. Although several veins have been found, development work has been confined to the most promising one. An adit was driven to tap the vein at a depth of 100 ft., and drifts have been run several hundred feet along the vein. Stopes are being opened on ore of good grade. A Joshua Hendy mill of four 1250-lb. stamps is being installed on Chatam Creek, about a mile below the mine. It is expected that this mill will be put in operation in September.

Edward Willis, lessee of the Pioneer claim, on Chatam Creek, has placed an order for a 5-stamp Joshua Hendy mill. There is a good body of rich ore lying between the surface and the drift at a depth of 80 ft., which will be extracted before further sinking is attempted. In the past, water has caused much trouble on this property, hence the determination of the operator not to go below the frost line until it becomes necessary.

On the Rexall, at the head of Wolf Creek, a promising body of high-grade ore has been developed. A Joshua Hendy mill of two stamps has been ordered and will be installed at once. A recent shipment of 10 tons of ore from this property yielded $180 per ton.

McCarty and Furseneau, on the Wolf-Fairbanks divide, are installing a boiler and a hoist at the mine. The shaft is down about 100 ft. At 60 ft., drifts were run on excellent ore. A Little Giant stamp mill is in process of erection near the head of Fairbanks Creek.

Angus McDougall, adjoining McCarty on the south, has discontinued stoping operations for the present, and is engaged in deepening his shaft. Two hundred tons of ore that is expected to mill better than $40 per ton will be put through the Burns mill on Chatam Creek at an early date. A mill has been ordered for this property, but it is not expected to arrive this season.

A hoist has been installed on the Rainbow claim, in Skoogey gulch by Zimmerman, the lessee. A narrow vein showing $40 ore has been uncovered for several hundred feet on the surface. The shaft and drifts also show good ore, so the outlook for this property is bright. A compressor, drills, and a stamp mill will be ordered soon.

The Hudson Bros., on Ester Creek, have what is reported to be the best of the many good prospects of this camp. There are several stringers ranging in width from one inch to one foot and sepa-

rated by schist. Assays on samples taken across a total width of 18 ft., including schist and all, give a gold content of $38 per ton. Some of the individual stringers are very rich, but it is proposed to mill the entire lode without any attempt at sorting. The erection of a 2-stamp Nissen mill is under way.

The little Spalding mill of three 250-lb. stamps on Dome Creek is making expenses for the Reliance Mining Co., a 2-stamp Nissen mill has been ordered, however, and will be installed this season, if possible. A Joshua Hendy 2-stamp mill recently arrived for Doctor Sutherland. This is to be erected in the Kantishna district.

British Mineral Output for 1911

The production of mines and quarries in the United Kingdom in 1911, was as follows:

Arsenic, 2144 long tons; arsenical pyrites, 1170; barium compounds, 44,118; bauxite, 6007; bog ore, 2700; chalk, 4,883,706; chert, flint, etc., 72,597; clay and shale (not including fire and china clay), 10,413,170; china clay and stone, 849,538; coal, 271,891,899; copper ore and precipitate, 3262; fireclay, 2,482,-846; fluorspar, 45,231; gold ore, 2752; gypsum, 276,684; igneous rocks, 6,520,-696; iron ore, 15,190,512; iron pyrites, 10,114; lead ore, 23,910; lignite, 120; limestone, 12,183,255; manganese ore, 4987; mica, 24,335 long tons; natural gas, 221,400 cu.ft.; ocher and umber, 14,-585 long tons; oil shale, 3,116,803; rock salt, 200,620; salt from brine, 1,882,-068; sand and gravel, 2,280,248; sandstone and quartzite, 4,044,907; slate, 325,125; tin ore (dressed), 7746; strontium sulphate, 5869; uranium ore, 67; wolfram ore, 266; zinc ore, 17,652 long tons.

Mining Companies and the Corporation Tax

WASHINGTON CORRESPONDENCE

Commissioner of Internal Revenue Cabell has appointed hearings and conferences at a large number of western cities at which he will shortly discuss with representatives of mining interests the question how mine property should be reported in connection with the payment of the corporation tax. Some time ago the bureau issued regulations covering this subject. The regulations were extremely elaborate but that has not prevented them from being subject to doubt and criticism relating to the question what allowance ought to be made from year to year in the value of property reported for taxation as regards ore reserves which lessen from year to year. The cities at which the commissioner of internal revenue will stop while *en route* for these conferences include St. Paul, Seattle, Los Angeles, Santa Fé, Denver, Kansas City and possibly some others. Some conferences on the same subject have been held within the last few days in Washington, but these were merely preliminary to the western trip. Mr. Cabell started Sept. 17 on his trip.

The Bureau of Internal Revenue takes the ground that it will not materially change the general principles laid down in the rules already given out but that it will endeavor to get at the facts of each individual case in which a return for the purpose of taxation is to be made, in order that proper allowances may be worked out on a definite system.

The present working of the corporation tax is unsatisfactory in the mining industry and complaints reached Congressmen frequently during the last session. It is understood that one of the pieces of legislation that will early be taken up will be a measure designed to correct some of the defects of the present enactment. The present work of the commissioner of internal revenue is being carried on without regard to the probability of changes in the law.

Workmen's Compensation Act in Michigan

NEGAUNEE CORRESPONDENCE

Regarding the new Workmen's Compensation Act which went into effect on Sept. 1, it is announced that over 2000 firms and companies throughout the state have signified their intention of coming under its terms. This number includes a great many of the mining and railroad corporations of the upper peninsula. Large employers will as a rule carry their own risks, as is optional under the law, and in hazardous industries such as mining, it is not likely the payments on account of death and injury claims will much exceed the payments of claims and lawyer fees under the old conditions. But the small employer who has in the past protected himself by liability insurance, will have to pay a much heavier premium for protection under the new law. The insurance companies have announced their rates for liability insurance under the new law, based on their experience in Wisconsin where the liability law has been in effect for one year and in Connecticut where it has been in effect two years. In many occupations the rate has been increased, thus on laundries has been increased thus was 40c. on $100 of annual payroll, and on saw mills was $0.60 for $100 of annual payroll; under the new rules these have each been increased to $4.95. Underground iron mining is rated as one of the most dangerous occupations, as the new rate is $10.50 per $100 of annual payroll. Copper mining is considered less dangerous, being rated at $6.60 per $100 of annual payroll. Blast furnaces and smelteries are rated at the same figure, $6.60; and logging and lumbering are scheduled at $3.85 as compared to the old rate of 85c. The following rates are also announced: Masons $5; carpenters, $3.50; concrete workers, $4.75; machinists, $1.65; blacksmiths, $3.85; stores, $0.44 to $0.55; hospitals, $0.55; public libraries, $1.38. If, after trial, these rates are found to be too high, it is announced that they will be lowered, for excessive rates would encourage excessive competition in the insurance business. If an employer fails to protect himself either by assuming his own risks under the compensation law, or by taking out liability insurance, he will be liable to face suit in case of injury or death of an employee with all but one of the old law defenses taken from him.

Chinese Tin

The tin mined in the province of Yunnan, China, so far as exports are concerned, is handled almost exclusively at Hongkong. The concentrates from the mines at Mengtze are smelted and refined at Hongkong. This year, up to June 30, the quantity exceeded that for the entire year 1911, the value of the shipments to the United States for the six months being $908,447 gold, against $789,941 for the full year 1911. This increase was due to the high prices for tin obtained this year, which resulted in the shipment of large stocks carried over from last year.

According to a recent consular report, Yunnan tin is classed in three grades, No. 1 being 98.5 to 99% pure tin; No. 2 being 97½ to 98%, and No. 3 being 95 to 96%. Current prices at Hongkong, July 1, per pikul of 133⅓ lb., were $117.50 in Hongkong dollars, for No. 1; $115.50 for No. 2 and $111 for No. 3. At current exchange these prices were equivalent to 43.45c., 42.7c. and 41c. per lb., respectively.

International Mining Experiment Station Conference

This conference is being held this week at the U. S. Bureau of Mines station in Pittsburgh and at the experimental coal mine operated by the Bureau at Bruceton.

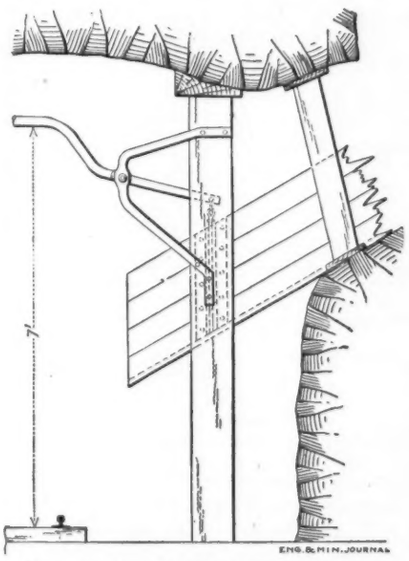
If the conference so desires, arrangements will be made for evening meetings for continuance of discussions. After the conference has adjourned further special tests may be made at the experimental mine of such nature as the members of the conference may desire. Informal visits will be arranged for guests to some of the coal mines of the Pittsburgh or other districts.

Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

Methods of Hanging Chute Door and Lever

In the accompanying drawing is shown the manner of supporting the lever of a chute gate as used on some of the chutes in the mines of the St. Louis Smelting & Refining Co., in the Flat River district of southeastern Missouri. The gate lever is carried by two iron brackets bolted to the uprights of the chute and is bent up so that the fulcrum may be placed high enough to be out of the way of miners passing along the track; beyond the fulcrum the lever is bent downward so as to be within reach of the miner on the opposite side of the drift. The carrying braces are bent in so that they are only



METHOD OF HANGING CHUTE DOOR

as wide as the gate lever bar at the point where the bolt goes through.

A slide gate is used that runs in an angle-iron guide fastened through the side planks to the main timbers of the chute. The lever is connected by a pair of clevises to the gate, which is a plate of heavy iron, but the lever also extends far enough beyond the gate to come over and to shove the gate down to its seat in case it should stick.

The gate works well and no more "runs" of ore occur than would be the case with any top-closing gate. The manner of supporting the lever allows it to be brought out straight in front of the gate so that the loader can look up into the chute as the ore runs out and shut or open the gate according to how the boulders may be coming down and how full the car is at the time. The bending of the lever up into a goose neck so that over the track it is above a man's head when the gate is only half closed, removes any objection to the gate lever extending out across the drift.

Foot-Wall Shafts in Lake Superior Copper Mines

In the Lake Superior copper district, the increase in the size of mining units and improvements in mining methods, are constantly tending to reduce costs. Methods in vogue today may be materially modified, if not discarded, some years hence. Any conclusions based on figures of today should, therefore, be scrutinized with reference to possible future improvements. It is also true that no policy of administration nor system of mining will fit all mining properties alike, or necessarily the same mining property during all periods of its activity, said L. L. Hubbard during an address before the Houghton meeting of the Lake Superior Mining Institute.

In accordance with time-honored practice, shafts have usually been sunk directly in the lode to be mined, because in and from such shafts a thorough examination of the lode is possible in the quickest and most economical way, and the average richness and physical condition of the ground are directly ascertainable. Where, however, these considerations are not of paramount importance, as for example possibly on a property where one or more shafts are already down, and others are to be sunk to increase production from the same lode, or where by diamond-drill exploration or otherwise, the lode is known to be rich in the neighborhood of the proposed shaft or shafts, we may well consider an alternative to a practice that ties up in shaft pillars a considerable amount of ore during the life of the mine. Moreover, where the dip of the lode is variable, as is often the case, or where the average dip is not known in advance, the exploratory function of the lode shaft is at least curtailed, if not altogether lost; and while the dip of the shaft can eventually be readjusted to the actual dip of the lode, a variable dip in the shaft is from an operating point of view, at least a detriment, if not a menace.

A shaft sunk in and within the limits of the vein or lode, must be supported on at least three sides, to its ultimate depth, by an envelope of lode rock capable of sustaining not only its own weight, but also the pressure induced in the overlying rock by the removal of its support under a large area. Under one system of mining, supporting pillars are left from point to point in the levels or stopes, if possible only where the rock is not worth extracting; under another system, good rock removed is replaced by a filling of waste rock, but even if the filling be complete, a settling of at least 10% of the filled area has been declared to be possible; under the first system even more disastrous results have followed, from the crushing of pillars and caving of the hanging. In either case, movements in the shaft are apt to cause delay and expense, if indeed the shaft be not ultimately wrecked.

What then are adequate shaft pillars will doubtless depend in each case, much upon the dip of the lode, the inherent strength of the rock, and the absence of "slips" or joint planes. The size of the pillars can hardly be stated in terms of an equation. Based on local practice, a minimum average width of 50 ft. in the pillars for a shaft intended for a depth of 5000 ft., seems small enough, and a mine manager would run little risk of criticism if the width were even greater. If the dimensions of the shaft be assumed as 10x20 ft., and the lode be 15 ft. thick, the block of lode material surrounding the shaft will then have 120x15, or 1800 sq.ft. of area, less the shaft opening (10x20 ft.), or 1600 sq.ft. net. This rock, if the shaft were in the foot wall, could be extracted more cheaply than any other rock in the mine, and much more cheaply than shaft pillars can ever be extracted under the most favorable conditions. However confident we may be that this ore will be eventually recovered, we are still facing the enormous loss entailed by tying it up during the life of the mine.

At first glance it may be thought that a shaft in the foot wall will be more costly than one in the lode, by reason of the crosscut necessary at each level. If the shaft is placed about 50 or 60 ft. from the lode, it will probably not be endangered by the blasting in the lode. At the end of the 60 ft. of crosscut economical mining may begin at once, in two directions, whereas with shaft pillars extending 50 ft. from the ends of the shaft, at least 100 ft. of drifting is necessary before reaching those parts of the lode

that can be similarly mined. It is true on the other hand that rock extracted in the drifts may pay the whole or at least a part of the cost of drifting. It may also be true that the foot-wall rock may be harder and more costly to mine than the lode rock, and this is one of the few economic disadvantages of foot-wall shafts.

It has been suggested that in a mine where the rock appears to be particularly under stress, another advantage in a foot-wall shaft would lie in the fact that as soon as the lode matter is extracted opposite the shaft, the stresses in the rock next to the shaft are immediately relieved, and there will result a greater stability in the shaft on this account. I believe this point is well taken.

In any event, if the shaft is in the foot wall, it will be more exempt from those disasters that sometimes overtake mines even where the greatest foresight has been exercised. With the shaft intact, safe egress for the miners that can reach the shaft is assured, and ingress to any level in the mine can speedily be obtained. With a shaft out of commission by reason of earth stress, production is interrupted, costs of production are raised, and shaft repairs made necessary at considerable cost. For these several reasons will not the physical advantages of a foot-wall shaft fairly outweigh the slight probable disadvantages and miscellaneous extra costs, even if we disregard entirely the enormous capital locked up in shaft pillars?

Sampling at the Miami Mine

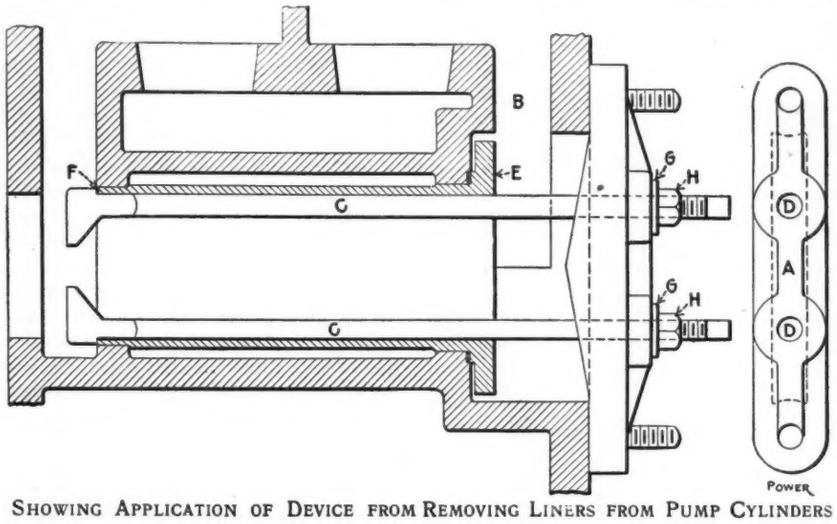
At the Miami Copper Co., the mine sampling is done under the direction of the chief engineer. The chief sampler directs the underground work in a general way, dividing his time about equally between the sample-crushing plant on the surface and underground.

Samples in all drifts and raises are taken by the assistant sampler, usually a young engineer, and two helpers. It is aimed to take samples of all drifts and raises as close behind the advancing face as possible. The crew makes the round of the mine at least once every two days, the most active portions being visited every day. Once each week the assistant sampler measures the position of every face in the mine and these data are used in keeping the mine map up to date. Measurements are made from the regular survey stations and for sampling the ore is divided into 5-ft. blocks.

The channel method of sampling is used entirely in the drifts. An iron box is held in proper position to catch the sample cut with hammer and moil. About 50 lb. of rock is the aim for each sample, one-half of which is taken from each wall of the 5-ft. section of drift. While the helpers are taking the sample the assistant sampler records the location and prepares the identification tag to be put in the bag with the rock. This tag is a block of wood about 1½ in. long and 1 in. wide; on it are noted the location of the sample and the character of the ore. The channel is made at the most convenient height, no rule being followed except to have it represent its particular block of ore. The ore from the shrinkage stopes is sampled at the chutes on the main haulage levels.

Device for Removing Water Cylinder Liners

The removal of liners from the water cylinders of pumps is usually a troublesome job, especially if the liner is stuck as it often is, says W. H. Wolfgang, (*Power*, Sept. 10, 1912). This trouble can be avoided and their removal made easy by the use of the device shown. The casting *A* is slipped over two studs after the cylinder head has been removed as at *B* and then the two pull bolts *C* are pushed through holes *D* in the casting and made to engage the back end of the liner *E* as at *F*. The washers *G* and nuts *H* are then tightened to hold the bolts in place. By screwing up on the nuts the liner can be started and thereafter easily removed. The device may also be used to drive the new liner in place.



SHOWING APPLICATION OF DEVICE FROM REMOVING LINERS FROM PUMP CYLINDERS

Novel Drilling Method

A new method of drilling with the rotary is being put in practice in well No. 10 of the Amalgamated Oil Co., in the La Habra field, in California, says *Oil Age*, Aug. 9, 1912. Instead of using water for drilling purposes, oil is being employed. If there is any water stratum passed through, there will be no mistake about it, as it will show up plainly in the drilling oil. At present the difficulty of distinguishing intrusive water from drilling water has been one of the drawbacks of the rotary system of drilling. The method of using oil is not entirely new, but it is new in this field.

Corrosion of Iron and Steel Pipe

The resistance to corrosion of iron and steel pipe has been the subject of controversy for a long time, both steel and iron having adherents who believe the one would corrode less than the other under the same conditions. A recent series of experiments undertaken by William H. Walker, of the Massachusetts Institute of Technology, results of which were published in July, 1912, by the National Tube Co., indicates that there is no difference in the corrosion of iron and steel pipe taken on the average.

Naturally a poor steel will show less resistance to corrosion than a good iron, but the converse is also true. Comparisons should be made on practically equal grades of product.

Water which contains oxygen induces a rapid corrosion of pipe of either kind, while water without oxygen, other conditions being equal, will show much less corrosion, or none at all if no other corrosive elements are present.

Doctor Walker made 64 comparisons of steel and iron pipe where the history of the installation was known. The cases where iron was found more corroded than steel amounted to 20, and where steel was more corroded than iron to 18. There were 9 cases where there was no difference between the two.

In order to determine the relation between the so-called acid-corrosion test and actual corrosion in service an experiment was made in which pipes were subjected to 20% sulphuric acid for four hours at room temperature. Although every care was taken to have identical conditions with all samples subjected to the test, it was found that no reliance could be placed in it. It was shown to be erroneous and misleading. The acid test not only did not agree with the service test, but the steel and iron showed no agreement when considered by themselves.

Details of Metallurgical Practice

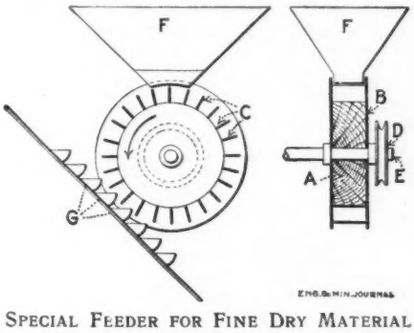
Records of Experience in Ore Dressing, Cyaniding and Smelting

A Feeder for Fine Material

BY HERBERT A. MEGRAW

A problem in ore feeding presented itself to me not long ago in connection with the treatment of a large accumulation of dump material. This material was ore rejected in old smelting operations in Mexico, and consisted of particles varying in size from ¼ in. to —200 mesh. It was largely composed of iron oxides, which, with the proportion of slime contained, gave a decided tendency toward packing, even in the dry state. The material was to be cyanided and as it lay on a level lower than that decided upon for the grinding machinery, it had to be raised by means of a belt-and-bucket elevator.

An important detail was the rate at which the material should be raised, because all the machinery following was automatic and it was essential that the ore should come up in a constant, even stream.



SPECIAL FEEDER FOR FINE DRY MATERIAL

The first feeder tried for delivering the material in the desired way to the belt elevator, was a screw, but the fine material packed between the screw and its casing and required so much power that the device had to be discarded. Various forms of pushers were then tried but without a great degree of success. The design shown in the accompanying drawing proved to be most satisfactory.

It consists of a wooden wheel *A* with a sheet-metal disc *B* on each side of it, mounted on a shaft *E* which is moved by the pulley *D*. The channel formed by the wooden wheel and the sheet iron discs is divided into a number of pockets by the divisions *C*. These divisions do not reach to the circumference of the metal discs but stop about one-half inch short of it. This is in order to allow the small end of a hopper *F* to fit into the pockets and between the metal discs. By revolving the wheel in the direction indicated by the arrow, a constant supply is cut out of the hopper by the pockets, and delivered in a uniform stream to the buckets *G* of the elevator. The hopper may be of any convenient size and the other dimensions of the device will naturally vary as the requirements. By regulating the size of the pockets and the revolutions of the wheel, a constant uniform stream of any desired quantity may be delivered to subsequent machinery.

Conker Plate Details

BY PERCY E. BARBOUR*

Various types of conker plates for the bridge walls of reverberatory furnaces have been tried with the varying results to be expected. The Garfield type of conker plate, which is now giving perfect satisfaction, is the result of consistent and continual development since the first reverberatory was built at this Utah plant in 1905.

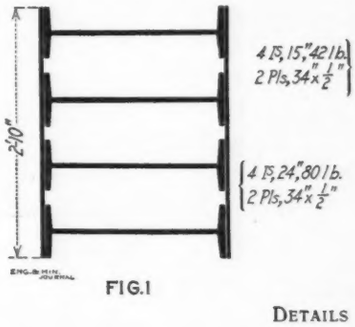


FIG. 1

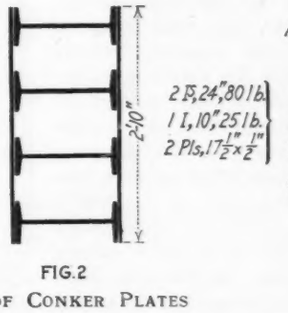


FIG. 2

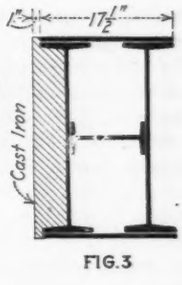


FIG. 3

DETAILS OF CONKER PLATES

The first conker plates used in furnaces Nos. 1 and 2, and shown in Fig. 1 were built up of four 24-in., 80-lb. standard I-beams laid horizontally and fastened rigidly to two ½-in. plates standing vertically against the flanges of the beams. This conker plate failed by crippling, or better said, by warping of the webs, as it was the excessive heat rather than the pressure of the furnace burden which caused the failure. The latter was of course only gradual and did not cause a catastrophe. The total cross section is so great that unless brick-work which would make the bridge wall of prohibitive size were used, the steel section does not get sufficient protection from the heat.

On furnaces Nos. 3 and 4, the plate shown in Fig. 2 was used. This consisted of four 15-in., 42-lb., standard I-beams with two ½-in. plates built up as the former plate was. This gave a greater thickness of brickwork against the sides but no more on the top and the plate was not wholly satisfactory, due again to crippling of the webs of the beams.

Furnace No. 5 had a conker plate made of three 10-in. 25-lb. standard I-beams arranged as shown in Fig. 3, with a cast-iron plate on the furnace side, and two ½-in. plates on the flanges, at top and bottom. This section gave better results, but the air spaces were too small for the circulation required and the I-beams were changed for the No. 6 and last furnace.

This conker plate for the No. 6 furnace is excellent because it does the work and it does the work because it is excellent mechanically. It is composed of two 24-in. 80-lb. standard I-beams, shown in Fig. 3, standing vertically, with a 10-in. 25-lb. I-beam laid horizontally along the middle of the webs of the others. This small beam stiffens the long webs of the larger beams and prevents warping. The top and bottom of the steel section is completed by two ½-in. plates. All these members are riveted rigidly together. The furnace side of this plate has bolted to it a cast-iron plate thick enough to extend 1 in. beyond the flange of the 24-in. I-beam, as shown. This cast-iron plate is made in sections with the joints vertical and halved into each other so that at the joints the I-beams will not be unprotected. The blast pipe for the blast-furnaces is tapped and a small pipe delivers air at one end of this conker plate which blows through the other end and keeps up a circulation. This conker plate is satisfactory.

*Manager, Uwarra Mining Co., Candor, N. C.

Testing Lubricating Oils

Scientific testing of lubricating oils is outside the province of the average engineer, needing as it does elaborate apparatus and special chemical training, says Francis H. Davies (*Power* Sept. 10, 1912). Still, it is desirable that the man responsible for the running of a plant should be able to make at least a few elementary tests, as oil has directly and indirectly a material bearing upon operating costs.

A simple method of ascertaining whether an oil contains acid or not is to immerse a polished copper plate in it for a few minutes. If no acid is present there will be no change in the appearance of the plate, but a trace of acid will dim the surface.

To determine whether a mineral oil is pure and well refined, a small quantity of strong sulphuric acid should be added to a sample. This will have no effect on the color of the oil if it is pure, but if it contains fatty material of any sort, discoloration will result. The addition of sulphuric acid has the effect of raising the temperature of an oil. An increase of temperature of about 20° C. is the maximum that should occur with a good oil.

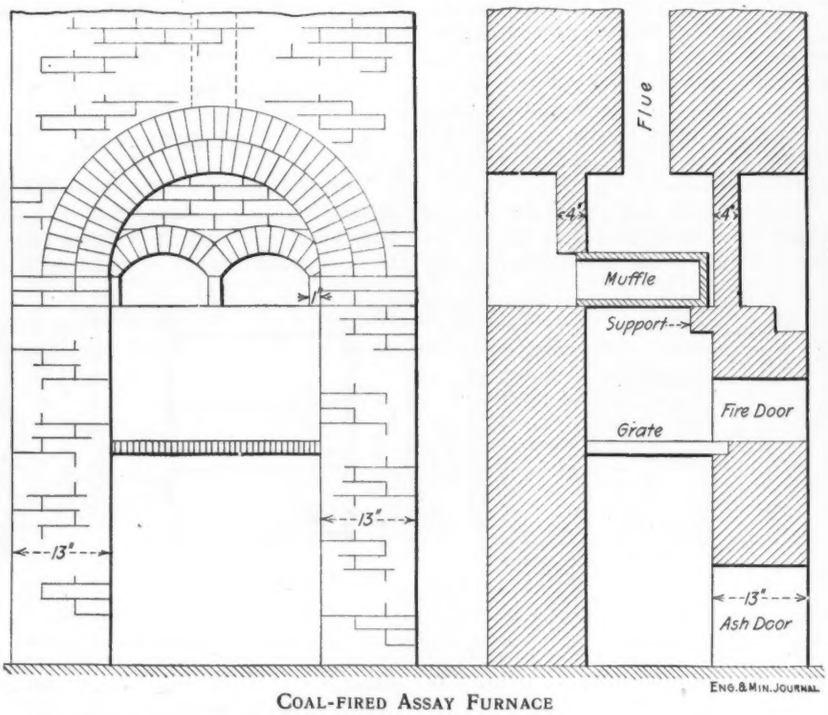
The solidification temperature of a lubricating oil is an important matter, and an approximate idea of the nature of any particular sample may be obtained by smearing it over the surfaces of two polished iron plates and laying them together. They should then be left for some days. If they do not move as freely over one another as at first it is evident that the oil used is one which tends to solidify. This is only a rough test. If it is desired to ascertain exactly at what temperature an oil will congeal, two or three inches of oil should be poured into a test tube about 1¼ in. in diameter, which should then be inserted into a freezing mixture. While solidifying it should be stirred constantly with a thermometer, and the tube should be left in the mixture until the oil is solid. It should then be removed, and the stirring with the thermometer continued until the oil becomes liquid and clear. The temperature of the oil when the last portion becomes fluid, is the temperature at which solidification begins to take place. For accuracy, this test should be repeated several times and an average result obtained.

When testing mixed oils having both mineral and fatty constituents, an approximate idea of the proportions of the two for purposes of comparison may be obtained by mixing a small quantity of the oil with a strong solution of caustic potash. If the mixture is well shaken, an emulsion will be formed varying in proportion to the quantity of fatty matter present. This test is useful for making a rough comparison between several oils, but it does not give any indication of the relative proportions of the two ingredients in any one of the oils. With a pure mineral oil there will be at most a slight cloudiness, but saponification will be marked if either animal or vegetable fats are present.

Coal Fired Assay Furnace

The results obtained with the furnace shown in the accompanying illustration, in cupellation, as well as in high temperatures, excel those obtainable with any other furnace that has come under the observation of the assayer who sent the sketch. He reports that the ease with which the temperature can be regulated is greater than with a gasoline furnace.

There are three furnaces in the installation, two on one side of the flue and one on the other. The furnaces are built independent of the flue so that either furnace or the flue may be repaired without interfering with any of the others. Each furnace is also supplied with an independent opening to the flue so that there is no interference with the draft of any of them.



COAL-FIRED ASSAY FURNACE

The large arch shown in the front of the furnace is concentric with the reverberatory arch on the inside, but is independent of it so that the reverberatory arch can be taken out and replaced without interfering with the front and back arches. The wall in front is 13 in. thick except in the arch, which is only one brick thick. The muffles are 12x24 in. with a 1-in. space between them and a 1-in. space between the muffles and the furnace walls. The grates are placed 18 in. beneath the muffles and the tops of the grates are on the level of the bottom of the fire doors, so that there is no depression to become clogged with clinkers.

With this furnace cupellations can be made and feathers made in rings all around the buttons and down to them. It is also adapted to high-temperature work, as gold and copper fusions can readily be made in a short time.

Canvas Table Concentration in California

By A. H. Martin*

California milling methods have ever been characterized by simplicity. The generally free-milling quality of the ore has militated against employment of advanced reduction practices, and in most of the California mining regious milling is much the same today as in the early years of the industry. Recently a few companies have discarded the canvas table and vanner for cyanide plants, but in many places the old-time method still commands popular favor.

In the early days of California practice, bullock hides and blanket sluices were employed to arrest the gold escaping the amalgamating plates. Later heavy, rough woolen blankets were used, these being expressly manufactured by the woolen mills for this purpose. Then came the idea of constructing inclined tables with blanket surface. From this to the canvas table was but a step.

In California practice two distinct types of tables are employed, one long and narrow; the other broad and short. The latter design appears more generally favored, owing to the ease with which it

*Redding, Calif.

may be handled, but both types have advocates. There are numerous variations of these tables, running from the most primitive design to the Darrow-Hambric concentrator, shown in the accompanying illustration.

In installing a canvas plant a site with a natural slope is selected, one giving an inclination of 1 to 1½ inches per foot. Should the natural slope be lacking the plant must be built to obtain it. It is necessary to sink the supporting posts to bedrock, as the foundation must be secure to insure the constant maintenance of original inclination and stability. If bedrock is too deep other provisions must be made to insure permanence of foundations. The stringers usually have dimensions of 2x8 in., with the flooring of pine or redwood planks. Perfect alignment of planks must be maintained to insure an even flow of pulp and it has been found best to employ dry lumber. The planks are laid about one-half inch apart, to allow for swelling of lumber when the water is turned on. Over the planks is stretched the canvas covering, generally consisting of No. 8 material. Short lengths of hose are provided at convenient intervals to facilitate the frequent washing of concentrators. Movable strips of wood are used to deflect concentrates into the launders running alongside. The plants cost little to construct, are operated at low labor cost, and effect an excellent recovery from free-gold mill tailing. Generally the tailing from the plates passes over Frue vanners before going to the canvas tables, resulting in a more satisfactory concentration.

One of the best examples of canvas-table concentration in California is at the Kennedy mine, near Jackson. This is the largest gold producer in the State, and the deepest gold mine in America. The tailing from the amalgamating plates passes to forty 6-ft. Frue vanners, and from these over 56 canvas tables. The tables are 12 ft. wide by 13 ft. long, arranged in double rows. Short lengths of hose permit frequent washing of tables. Before the pulp passes from vanners to tables it is first received by a Gates classifier, which separates the valueless coarse sands from the fine product, thus lessening the quantity of material to be handled by tables. The concentrates gathered by the tables range from $40 to $45 per ton in value. The tailing leaving the tables assays about 60c. per ton, but to release this small per cent. of gold, fine grinding is required, a practice that the Kennedy management deems economically impracticable. The total mining and milling cost at this mine averages about $3 per ton. 60-in of water are required in the operation of batteries, vanners and tables. The Kennedy is one of the most progressive companies in California and its continued employment of the canvas table demonstrates the merit of the system. Besides the Kennedy, the Argonaut, Melones and other leading companies operating in the Mother Lode also utilize the canvas table in concentration.

DARROW-HAMBRIC CANVAS CONCENTRATOR WITH ONE SECTION REMOVED

The Darrow-Hambric concentrator is modeled upon distinct lines, and is designed to secure a maximum of service at lowest economical working and labor costs. The table consists of a series of broad sluices mounted on a circular frame, with a usual diameter of 28 ft. The tables are arranged in tiers or decks with 21 to 24 trays to the deck. Each tray is 4 ft. wide by 3 ft. long, giving a total gold-saving area of 12 sq.ft. From six to ten tiers complete a machine, with the number of trays varying from 126 in the smaller machines to 240 in the larger types. The smaller tables have a surface area of 1512 sq.ft. and the larger ones an area of 2880 sq.ft. The circular platform is mounted at the center upon an upright axis, with arms radiating to the circumference. Rotation is accomplished by an encircling rope which passes over a driving pulley.

As the pulp comes from the classifier it is divided by "spreaders" located on the inner row of each tier of trays. This insures the even distribution and free flow so necessary for successful results. The trays incline slightly away from the center of the machine, the slope averaging 1¼ in. to the foot. The operator's pleasure regulates the grade, and any tray may be taken from machine and replaced with a new one at any time. Revolutions are so arranged that each tier of trays makes a complete circuit in 15 to 20 min., the speed depending upon the character of tailing handled. The feed is automatically regulated, being shut off at intervals pending the arrival of each section at the point of charging. A gentle current of water is admitted to the loaded tray and the lighter sand washed away. The concentrates are deflected into a launder, discharging into the settling tank by means of a steady spray from a perforated pipe.

It was formerly the practice to employ canvas-covered tables, but in the latter types asphaltic felt is utilized as a collecting agent. In some cases the plain lumber surface is merely covered with asphalt paint and subsequently coated with fine sand. In each instance it is claimed results have been more satisfactory than when canvas was employed. While the sand-coated tables carry less loads than those of canvas or felt, it has been found that they make a cleaner product and recover more gold than the manufactured coverings. The sand-treated tables have proven particularly satisfactory as cleaners, and, combined with the asphaltic felt trays, effect a high average saving. In operation the sand-coated tables are rotated more rapidly than the others, the rapid revolutions causing the sanded surface to become filled with fine sulphides.

The Darrow-Hambric tables are used at the Bunker Hill, Zelia and other large Mother Lode mines. The great points of superiority claimed for this plant over the ordinary canvas-table installation are the elimination of labor required in the average canvas plant, and the securing of a cleaner product. The entire operation is automatic and continuous, requiring practically no attention. At one property the product from the tables is treated by agitation with weak cyanide solution in Pachuca tanks. When this is done the concentrates are not cleaned on tables, the product running only $10 to $15 per ton. The machines are said to recover 60% of the assay values of the pulp which comes from the plates. That a larger percentage is not secured is due largely to the presence of gold in the coarse sands, which can only be released

by fine grinding. The Darrow-Hambric method of concentration is the patented invention of W. E. Darrow and F. Hambric, who have long been connected with Mother Lode milling operation.

Automatic Pump Control

In mining practice it is not always convenient to discharge the water used in cooling the jackets of air compressors, where it will run to some convenient place out of the way. In one instance it was necessary to discharge this cooling water into a tank under the floor of the compressor room.

In order to keep the water level in the tank uniform, a pump was used, which discharged the water at a distant point. The steam pipe of the pump was fitted with a globe valve, the stem of which carried a sprocket wheel. A sprocket chain ran over this wheel, one end being attached to a suitable weight and the other to a float in the tank which was directly under the pump. As shown in Fig. 1, as the height of the water increased or decreased, the float opened and shut the valve, so that the water level was kept practically constant.

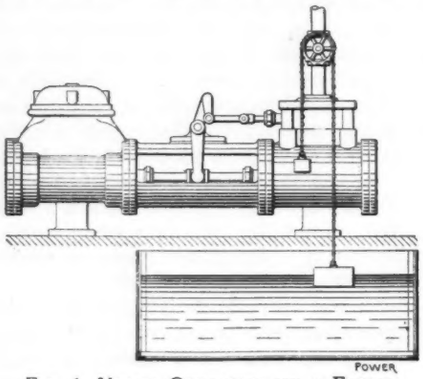


FIG. 1. VALVE OPERATED BY A FLOAT

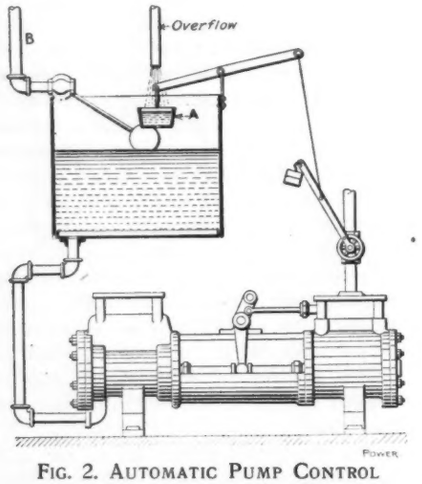


FIG. 2. AUTOMATIC PUMP CONTROL

In Fig. 2 is shown an arrangement devised by E. T. Lehman (*Power*, Mar. 5, 1912), to automatically keep a storage tank on a roof full. The small pail *A* controls the steam valve of the pump. The overflow from the tank empties into the pail, causing the valve to close. A small hole in the bottom of the pail allows the water to drain out. When no overflow is falling into the pail the water drains out and the weight on the valve lever over-balances the weight of the pail opens the valve and starts the pump. The makeup water is automatically supplied by the pipe *B*, which is controlled by a float valve, as shown.

Removing Broken Stems from Stamp Heads

Stamp shoes have to be removed so frequently from the stamp heads that they do not remain in place long enough ordinarily to become so firmly wedged into the head as to cause great difficulty in their removal.

But on the other hand the stems are seldom removed from stamp heads except when the stems break. Then it is usually the case that a small end of the stem is left in the stamp head, where it has been for some time and has become so firmly attached that considerable force is necessary to dislodge it. This is often accomplished by firing a small charge of dynamite in the head.

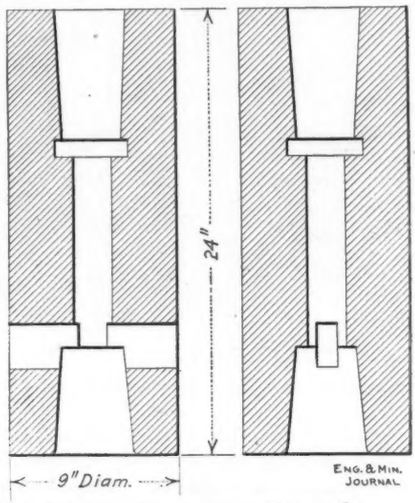


FIG. 1. STAMP HEADS WITH BORED CENTER

This practice has the disadvantage that stamp heads are often cracked from the blasting.

An improved type of stamp head is described by G. O. Smart in "A Text-Book of Rand Metallurgical Practice," and is used in some of the large stamp mills on the Rand. This stamp head is made with a conical opening at each end for the reception of the stem. There is a smaller cylindrical opening connecting these two openings, so that there is a continuous passage from one end of the head to the other, as shown in Fig. 1. This makes it possible to remove a broken stem in a hydraulic press, Fig. 2, especially equipped for the purpose.

When a stem is broken off and the short end cannot be readily removed from the stamp head, the stamp head is set upon the bed plate of a hydraulic press. A round hole is provided in the center of this bed plate. The stamp head is set over this hole so that the broken-off part of the stem is directly over it, and that end of the head in which is the broken stem is placed downward. A rod, nearly as large as the bore used in the stamp head, is dropped down upon the piece of stem. This rod extends up into the larger conical opening in the upper end of the stamp head. The plunger of the hydraulic press is tapered so as to fit easily within this conical opening. The plunger is brought forcibly down upon the rod in the stamp head, and as the pressure is increased, this rod forces the broken stem out of the bottom conical opening in the stamp head so that it drops through the round hole in the bed plate of the press.

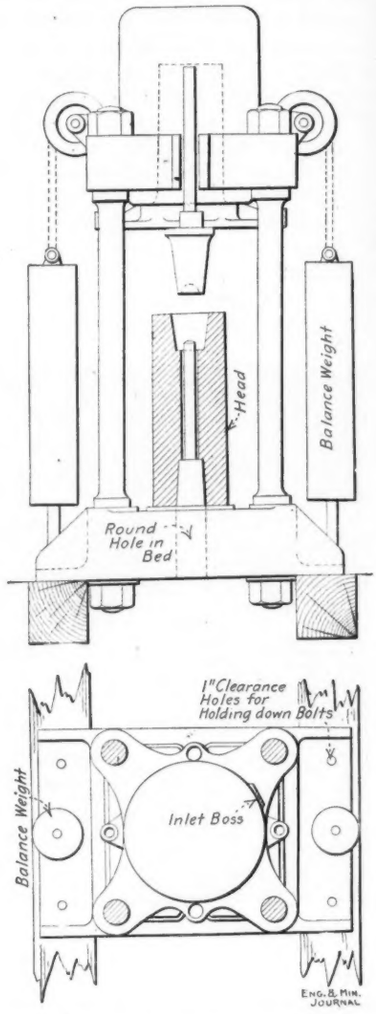


FIG. 2. HYDRAULIC PRESS FOR REMOVING BROKEN STEMS FROM STAMP HEADS

In timbering, the depth of a hitch should be governed, to some extent at least, by the nature of the rock, an inch or two often being sufficient in good ground.

Notes from Current Literature

Concerning Mining, Metallurgy and Industrial Chemistry

Oil Mixed Portland Cement

It was found by L. W. Page, of the Office of Public Roads, that when oil was mixed with portland-cement paste, the oil disappeared from the residual mixture and did not separate when the mixture became hard. The merits of such a mixture for waterproofing, if it is strong, are self-evident. The tensile strength does not suffer in a 1:3 cement-sand mixture, if the oil does not exceed 10% of the cement. The compressive strength suffers from the addition of oil, although not seriously with 10%. The elastic limit is the same as with plain concrete. The bond or grip of oil concrete for steel is much diminished with plain bars, but deformed bars, wire mesh, or expanded metal are effective for reinforcement.

The sand, cement, rock and water used for oil concrete should be of the same kind as that used in ordinary work. The oil should have a specific gravity of from 0.930 to 0.940 at 25° C., and should be soluble in carbon bisulphide at ordinary temperatures to at least 99.9%. It should contain 1.5 to 2.5% of bitumen, insoluble in 86° Bé. paraffin naphtha. It should yield from 2.5 to 4.0% of residual coke. When 240 c.c. of it is heated in an Engler viscosimeter to 50° C. and maintained there for three minutes, the first 100 c.c. which flow out should show a viscosity of not less than 40 nor over 45. The oil is added after the sand and cement are mixed with water, and the stone added last.

Determination of Ash in Coal

In determining the ash of a coal the most correct results are given by igniting the coal in an open platinum or quartz dish over the Bunsen flame, as the carbonates present are thus only slowly decomposed. (*Chem. Zeit.*, p. 757, 1912; abstr. *Journ.* Soc. Chem. Ind., July 31, 1912.) If the heating be continued after the coal is burnt, the weight of the ash is increased by the conversion of carbonates into sulphates by the sulphur trioxide in the products of combustion of the gas flame. Ignition of coal in the muffle or in a stream of oxygen gives low results owing to the decomposition of carbonates. The ash of a carbonate-bearing coal always contains sulphates. The amount of the latter is proportional primarily to the carbonate content, and in a secondary degree to the pyrites content of the coal.

The true ash of a coal is given by the formula: Ash on ignition in muffle—total Fe_2O_3—total SO_3 in ash+SO_3 in the coal +CO_2 in the coal+pyrites (FeS_2)+soluble ferrous oxide in the coal. The author found no sulphates in any of the unignited coals examined by him. The carbonates in the coal are best determined by treating the ground sample with dilute hydrochloric acid, absorbing the carbon dioxide in baryta water and titrating the excess of baryta with oxalic acid. Occluded carbon dioxide, if present, must first be driven off by warming the sample for a few minutes with water. The determination of the pyrites is based on the insolubility of this material in dilute sulphuric acid and hydrofluoric acid, the ferrous oxide in the coal being easily soluble. The soluble iron and the total iron are determined and the difference is calculated to pyrites. The difference between the total sulphur and the pyrites sulphur gives the organic sulphur.

Mechanical Detinning Machine

A mechanical detinning device has been invented by William M. Connor, of Baltimore, Md., (U. S. Pat. No. 1,021,302) which consists of a series of rolls, each pair of rolls rotating at a greater speed than the one preceding. The first set of rolls is plain, the rest have wire prongs, which decrease in size and number to the last set. Owing to the difference in speeds of successive sets the faster moving set exercises a scraping action on the surface of the metal. In order to prevent "tracking" of the sets of prongs, a series of cams gives the rolls a lateral motion.

Slag Inclusions in Steel

Dr. W. Rosenhain (England) and H. D. Hibbard (U. S. A.) presented papers on the subject of nonmetallic or slag inclusions in steel, at a recent congress of the International Association for Testing Materials. Mr. Hibbard, says *Engineering News*, has coined the word "sonim" for such inclusions, while Doctor Rosenhain prefers the words "slag inclosures." The two papers set forth that much about these foreign substances is as yet unknown. The discussion further emphasized this. The discussion in which E. H. Saniter (England), J. W. Richards (U. S. A.), E. Heyn (Germany), and R. W. Hunt (U. S. A.), participated also indicated that the essential facts concerning slag inclusions are not yet known. Work at the National Physical Laboratory (England) will be undertaken to determine whether oxides are soluble in steel and if so to what extent, though this study is highly difficult. Mr. Heyn emphasized the fact that minute inclusions are often more dangerous than larger ones, provided they are sufficiently distributed, and gave an example in which a thin layer of an inclusion high in calcium made a distinct plane of weakness in steel. Professor Richards advocated dead melting of the steel in an electric furnace and holding it one-half to one hour for the purpose of allowing all impurities to separate out, and Mr. Hunt reported that about 5000 tons of rails produced in this way had gone through the past winter without a single fracture.

The Trend of Quicksilver Metallurgy

The data now available shows that the recovery of quicksilver by the retort process in the United States is insignificant, says the U. S. Geological Survey. In 1911, there were 282 tons of ore treated in retorts, and 138,243 tons in shaft furnaces, from which recoveries were 172 and 21,084 flasks, respectively. The yield of metal was 46 lb. in retorts and 12 lb. in shaft furnaces, per ton of ore treated.

Retorts for recovery of quicksilver are of two types, known as the pipe retort and the D-retort. Both work on the same principle, that of distilling off the mercury from the ore separately from the gases of combustion and conveying the volatilized metal through short outside condensing pipes to a trough in which the mercury is collected. The retorts are themselves built over fire boxes, and are filled and discharged horizontally from the furnace floor, the D-retort by means of iron pans resting on the flat bottom and the pipe retort by means of shovels and semicircular hoes. Retort plants contain from one to 15 or more retorts, are inexpensive to erect and operate, and may serve useful purposes in the early development of a mine, but are best used, perhaps, for treatment of concentrates or furnace soot. Unless carefully operated, moreover, they menace the health of the workmen; and when in operation at new mines the temptation is to gouge out the rich ore of the mines, for which they are best adapted, and

quickly sacrifice a property that might otherwise be remunerative if worked on a larger scale and by better methods.

Over 99% of present domestic output is from shaft furnaces, in which the descending ore meets the upward heated furnace flames and gases, and the volatilized metal passes with the gases and impurities of combustion into a series of condenser chambers, usually of brick, in which the metal is collected and from which it is drawn off. The gases pass from the final chamber to the stack, usually through an inclined flue.

Quicksilver metallurgy has been highly perfected in California, and the best development is now observed in the various modifications of coarse-ore and fine-ore furnaces to be credited to California metallurgists. The modern tendency appears to be toward the increased use of the Hüttner tile furnace perfected by Robert Scott, formerly of the New Almaden mine, which is now adapted to both medium and fine ore. All the furnaces in Texas, and the new plant in Nevada, are of this type. At New Idria, are the coarse-ore furnaces designed by B. M. Newcombe, and at the Guadalupe mine are the Davey modified Litchfield furnaces.

Corrosion of Iron and Steel

Corrosion of iron and steel was treated by three papers by Lieut.-Comdr. F. Lyon, U. S. N.; H. Baucke (Holland), and F. N. Speller (U. S. A.), at the recent Congress of the International Association for Testing Materials (*Eng. News*, Sept. 12, 1912). Lieut-Comdr. Lyon has worked out a method for testing the relative corrodibility of iron in aqueous solutions, by using a series of dilute solutions of a given salt of successively increasing concentration and determining the concentrations at which general corrosion changes into local corrosion and at which local corrosion disappears. The smaller this range the less corrodible is the metal, he finds. Mr. Speller reviewed the recorded experiences on the relative corrodibility of wrought-iron and soft-steel water pipes in the United States and concluded that there is no evidence to show that steel pipes corrode any faster than wrought-iron pipes. The paper of Mr. Baucke (Holland), who cited cases where in his opinion the action of etching agents or electrolytes enlarged cracks and produced new cracks in metal which had been strained, was discussed by Doctor Rosenhain (England) and Mr. Heyn (Germany), both of whom raised serious doubt whether the phenomena observed by Mr. Baucke were correctly explained by him. Mr. Baucke claimed that the action of electrolytes on strained metals produced a tendency to recrystallization, which he looked upon apparently as an evidence of fatigue. P. Kreuzpointner (U. S. A.) stated that the tests of old boiler metal on the Pennsylvania R.R. for many years showed that all defects could be traced back to mechanical defects in the original working of the metal. Prof. William Campbell (U. S. A.) discussed the bearing of the electrolytic theory on corrosion, pointing out that even a uniform metal such as brass, that is, brass containing only one constituent, will pit through the whole thickness, under circumstances where local electric potential differences could hardly exist, and that in iron the pitting continues even after the small local impurity or segregated spot has corroded away. Gen. William H. Bixby (U. S. A.) described the conditions found on the wreck of the "Maine" when it was uncovered last year. Here it was found that all parts which were covered by the harbor mud, a kind of sewage deposit, were perfectly preserved and rusted only after this mud was removed and they were exposed to air. E. Heyn, discussing the corrosion of wrought iron and steel, remarked that corrosion is in his experience practically uninfluenced by small differences as to impurities contained and that a parallel corrosion test between two pieces of iron will show one or the other metal better according to the time at which the experiment is stopped, the metals often alternating many times in excellence in the course of a long-time test. Differences in composition (differences between pure and impure metal) are felt only during the first six hours, whereas after that time the behavior of pure and impure metal is substantially the same.

Cobalt-Chromium Alloys

Before the International Congress of Applied Chemistry, Elwood Haynes described some alloys of cobalt and chromium of interest to metallurgists and mechanics. An alloy made by smelting 90 grams of cobalt, 6.3 grams of tungsten and 18 grams of chromium with a little calcium silicide, in a graphite crucible, was so hard it would scratch glass and quartz crystal.

Holding the proportion of chromium at 15% of the entire mixture, and gradually raising the percentage of tungsten, the alloy becomes harder. At 10% W, the metal still forges readily, and takes a good cutting edge. At 15% W, the metal can still be forged, but requires great care to avoid checking. At 20% W the alloy can be forged a little, and can be ground to make good lathe tools for moderate speeds.

At 25% W, the alloy can hardly be forged, but can be cast in bars from which high-speed lathe tools can be ground. The tungsten can be increased to 40%, the alloy still retaining its cutting qualities, and for turning cast iron, the alloy answers even better than that containing 25%. Molybdenum also produces desirable high-speed cutting alloys.

As an example of its application to machine-shop practice Mr. Haynes said a ¾-in. bar of 40% W, was ground and used for turning cast-iron wheels, finishing 49 in 10 hours. The tool then only needed honing on carborundum to fit it for further use. With a steel tool the same man turned 26 in the same time, and ground his tool 50 times during the operation.

Samples of tools made of the alloy (stellite) were shown. They were of a beautiful silver-whiteness.

Decomposition Temperatures of Metallic Sulphates

The decomposition temperatures of metallic sulphates, a question of great importance in ore roasting, and, indeed, in general metallurgy was discussed by Dr. H. O. Hofman and Mr. Wanjukoff, before the joint meeting of the A. I. M. E. and the Congress of Applied Chemistry.

DECOMPOSITION TEMPERATURES OF METALLIC SULPHATES

Initial Substance	Final Product	Reaction Begins.°C.	Reaction Ends°C.
$FeSO_4$	$Fe_2O_3.2SO_3$	167	480
$Fe_2(SO_4)_3$	Fe_2O_3	492	560
$Bi_2(SO_4)_3$	$5Bi_2O_3.4(SO_4)_3$	570	639
$Al_2(SO_4)_3$	Al_2O_3	590	639
$PbSO_4$	$6PbO.5SO_3$	637	705
$CuSO_4$	$2CuO.SO_3$	653	705
$MnSO_4$	Mn_3O_4	699	799
$ZnSO_4$	$3ZnO.2SO_3$	702	720
$2CuO.SO_3$	CuO	702	736
$NiSO_4$	NiO	702	764
$CoSO_4$	CoO	720	770
$3ZnO.2SO_4$	ZnO	755	767
$CdSO_4$	$5CdO.SO_3$	827	846
$5CdO.SO_3$	CdO	878	890
$MgSO_4$	MgO	890	972
Ag_2SO_4	Ag	917	925
$6PbO.5SO_3$	$2PbO.SO_3$	952	962
$CaSO_4$	CaO	1200	...
$BaSO_4$	BaO	1510	...

The reason for the experiments was in the nonagreement of published data, which was probably due to different methods. Thus, work had previously been done in evacuated tubes, and in closed tubes, neither of which seemed directly applicable to metallurgic work; the first owing to the fact that metallurgists do not work with vacua, the second owing to the reversible reactions due to the presence of SO_3, SO_2 and O. The present experiments were made in a current of dry air.

In using the lead figures it should be remembered that as PbO itself volatilizes at 800° C., no final breaking-down temperature for $2PbO.SO_3$ can be given.

In personal conversation later, Doctor Hofman was asked whether his results were directly applicable to metallurgy, as his results were obtained in a current of dry air, while metallurgists were ordinarily forced to work with air carrying more or less water vapor. He stated that he believed the results were practical. With the single exception of the sulphates of iron, the dehydration temperatures of these salts lay well below the desulphatization temperatures, and that owing to this, he thought that the presence or absence of water vapor was immaterial.

Mining Problems at Santa Gertrudis

By W. G. Matteson*

At the Santa Gertrudis mine, Pachuca district, Mexico, three problems required solution: Inefficient labor, excessive water and a heavy orebody with bad hanging wall. A new pumping system is planned which will raise the efficiency from 41% to 85% and greatly reduce operating costs. The mining system, unique for this district, consists of driving a drift in the foot wall parallel to the vein and running cross cuts to the vein. A solid drift is obtained and little timbering is required.

*Mazapil Copper Co., Concepcion del Oro, Zacatecas, Mex.

The Santa Gertrudis mine is situated on the outskirts of the city of Pachuca, state of Hidalgo, Mexico. The famous range, of which this property is a part, is formed from Tertiary volcanic rocks, chiefly andesites and rhyolites, the general sequence of lavas being: (1) Rhyolite (Pleistocene); (2) later andesite (late Pliocene-early Pleistocene); (3) earlier andesite (Miocene).

Faulting Produced Fissures

Faulting, preceding mineral deposition, produced the fissures which were filled later by a quartz matrix carrying the precious metals. In the highly mineralized zone of black sulphides, pyrite and argentite were often deposited at the same time as the quartz and are so perfectly blended with the latter as to make separation impracticable. The quartz was also deposited alone in places, barren and rich portions alternating continually.

Santa Gertrudis Mine, Pachuca, Mexico

The principal veins are remarkable for their constancy and length, and contain many branches on the foot- and hanging-wall sides, forming splitting and reuniting groups. Brecciation in and along the veins, followed by propylitic alteration farther away, is common to the formations of Pachuca and the neighboring camp of Real del Monte. "Horses," displaced from the walls and floating in the quartz matrix, are found at all known depths, and of all dimensions. These "horses" are covered generally with quartz and sulphide ore.

Manganese, as the silicate combined with limestone, is found generally in close association with the vein material, often serving as a guide in the discovery of new orebodies. Pyrite is abundant in the mineralized portion of the veins and also in the immediate vicinity of the same, where it also serves to indicate the proximity of ore. Pyrite, occurring in grains or crystals, is barren; the granular pyrite of the main zone, on the other hand, is associated always with argentite, chalcopyrite, and sometimes stephanite and polybasite. Native silver is found at all depths. Generally when there is much rhodonite the ore is rich in its silver content. Numerous and extremely rich bonanzas, quite irregular in form, are found at the junction of cross fractures and branches with the main vein.

Ascending Solutions Source of Ore

Ascending solutions, which gathered their metallic constituents from deep-seated magmas, are generally conceded to be the origin of the Santa Gertrudis and Pachuca ores. The eruptions of andesite in this region took place through large fissures, and during these eruptions, other openings, parallel and adjacent to the fissures, were produced. Fumarolic and solfataric action with the circulation of siliceous streams of hot waters followed, bringing from below the sulphides and other metallic salts present in the magmas. The constituents of these waters were deposited in the open fissures upon the diminution of temperature and pressure.

The Pachuca and Real del Monte vein systems are shown accurately by the accompanying engraving. The Santa Gertrudis vein, which is the richest and most famous in the district, consists of one large well defined fissure zone with many branches. Chief among the latter are the south vein, the intermediate vein, the new vein and veins one and three. The south vein is of great extent and joins the principal fissure at the east end of the 11th level. All these branches are generally exceedingly rich. They are sought for continually, often at the ex-

pense of long crosscuts, and are an important factor in the successful operation of the mine.

Labor, Water and Timbering Problems

Three serious problems confront the management in solving the question of the most economic method of ore production. They are first, the low efficiency of the labor; second, the large inflow of water from the orebody and from the neighboring properties; third, the presence of a heavy orebody with a bad hanging wall.

Many reasons, including the lack of nourishment of the native since childhood, the filthy living conditions of the average *peon*, the general illiteracy of this class, the excessive use of the native beverage, *pulque*, the warm climate and the high altitude, have been given to account for the inefficiency of Pachuca labor. Another factor, which certainly has great influence upon the labor problem, is the observance of Mexican holidays. Every *peon* has his saint's day and there are two or three feast days in every month which are strictly observed by the working class, generally necessitating an almost complete suspension of mining operations.

In attempting to reach the root of the evil, the Santa Gertrudis company has undertaken the construction of neat, clean, well ventilated houses on the company's property, which are to be rented to the laborer for a slight consideration. In this way, the company hopes to establish a small mining community which it can depend upon more than formerly, despite the fact that the average Pachuca is exceedingly irregular in his habits of work. A large part of the work has been placed upon a piecework basis, and the *peon* now realizes that he must earn a day's wages if he is to be paid for the same. The ultimate solution of the labor problem, therefore, lies in the exercise of patience, care and skill in instruction on the part of the mine officials.

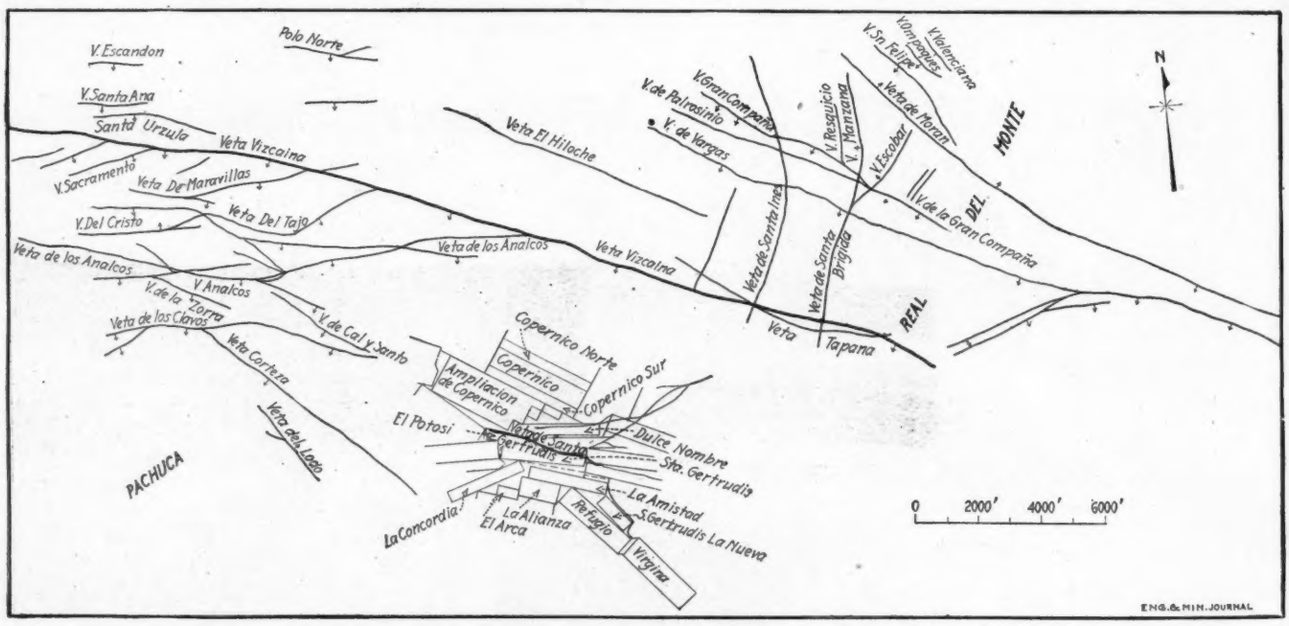
Wages in the Pachuca district at the present time are the highest in the history of the camp and equal or exceed the average of other Mexican mining communities. The scale now in use is as follows: Shift bosses, 7 to 8 pesos per day; machine men, 3 pesos; jigger bosses, 3 to 5 pesos; mechanics, 2.50 to 3 pesos; timbermen, 2.50 to 3 pesos; timekeepers, 3 pesos; pumpmen, 2.50 pesos; *barreteros* (hand drillers), 1.25 pesos; *peons*, 1 to 1.25 pesos; trammers, 1 to 1.25 pesos; muckers, 1 to 1.25 pesos.

Sinking and opening up new levels in the Santa Gertrudis mine is rather an expensive and irksome undertaking, due to the large inflow of water from the orebody and from neighboring properties. Sinking is undertaken first through the San Guillermo shaft which, at 1900 ft., is the deepest shaft in the district.

The main pumping station is at present on the 15th level. All the water from the lower levels is lifted to this station by auxiliaries where it enters two seven-stage, centrifugal Sulzer pumps, direct connected to 460-hp. motors and possessing a capacity of 3500 liters each per minute for a head of 335 meters when operating under 60 cycles, at a speed of 1150 revolutions and an amperage of 214. These pumps lift the water to the main tunnel which is 200 ft. below the surface. The larger proportion of the water drains through the tunnel but a vertical, triplex, electrically driven, Aldrich pump has been installed here to elevate water to the surface for the mill. A large Cornish pump has been placed also at the collar of the San Francisco shaft, to be used in case of a shutdown due to accidents in the regular pumping system.

The electric power at the mine was changed lately to 50 cycles, and under these conditions the centrifugal pumps run too slowly to lift the water to the main tunnel. This difficulty was eliminated by the installation of a booster pump which delivers the water into the Sulzers under a head of 75 meters.

The above system has several defects of a serious nature. It requires a large number of auxiliaries; the centrifugal pumps operate at an efficiency varying from 25 to 41%; no relief is provided for the Cornish pump which must be kept ready for instant use at a large expense; and finally the excessive power consumption due to the low efficiency, repairs and labor, result in high operating costs.



Pachuca and Real del Monte Vein Systems, with the Santa Gertrudis Claims

Plan to Reduce Pumping Costs

To remedy these evils, it is planned to install a new pumping station behind the San Guillermo shaft on the 18th level. A two-stage centrifugal, with a capacity of 1000 gal. per min., will be placed at the 19th-level sump to elevate the water to the main 18th-level reservoir, which has a capacity of 45,000 gal. The water from the reservoir will pass then to three duplex, horizontal, direct-connected, electrically driven Prescott pumps, each possessing a capacity of 500 gal. per min., and capable of lifting the water 1500 ft. vertically. In addition, a 14-stage, centrifugal Sulzer pump will be installed as an auxiliary plant in case of accident to the main system.

The water will be lifted to the tunnel as before where the vertical, triplex, Aldrich will take care of the mill supply. The installation of the 14-stage Sulzer will eliminate the Cornish pump altogether, which saves much expense with coal at 20 pesos per ton. The Prescott installation has an estimated efficiency of 85% as compared to 41% for the present system, and the number of auxiliaries employed is reduced 75%. The saving in operating costs, under these conditions, will pay for the new system in two or three years.

When the Camp Bird, Ltd., of London, purchased the Santa Gertrudis mine, the property was found to be in bad shape for economical ore production, the most serious conditions being a large tonnage of ore, accessible to inspection, but not to extraction; totally inadequate equipment, on surface and underground, for the economical production of ore, such as hoists, head frames, surface ore bins, haulage system, underground ore pockets at the shafts, mine ore cars, winze hoists, station and sinking pumps, machine drills, etc.; no shop equipment of importance to take care of the repair work; insufficient shaft capacity; development even behind the modest tonnage requirements of the former owners; unreliable and insufficient power service.

To overcome these faults and to prepare the mine for an economical ore production of 600 dry metric tons daily, or 18,000 dry metric tons monthly, as against scarcely 5000 tons extracted monthly by the former company, a most active campaign of equipment, development and improvement was commenced immediately.

Having found it impossible to sink the San Francisco shaft below the 17th level, due to the inability to handle the large inflow of water at that time on account of the poor power service, it was decided finally to retain this shaft ultimately for the service of men and materials only, and to prepare the old San Guillermo shaft for hoisting ore.

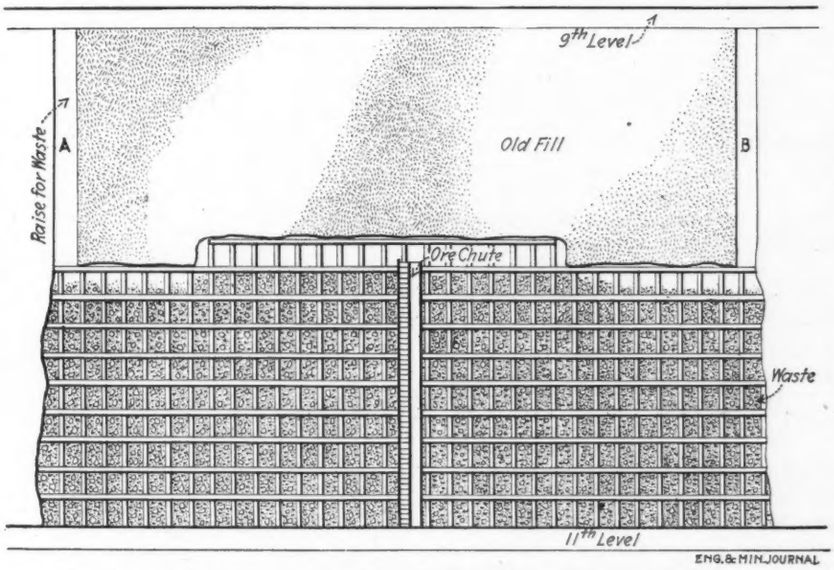
Hoisting Capacity Now 1000 Tons Daily

At that time the San Guillermo shaft, sunk vertically to a point just above the 17th level, but not connected therewith, and of a small section from the collar to the 13th level, was out of service and in a partly caved condition due to neglect. It has now been arranged to accommodate a 5-ton skip with its overbalance; the masonry from the collar to the ninth level has been put in good repair; steel dividers and end plates have been installed, and the portion from the ninth to the 13th level, where the shaft passes through the vein, has been heavily and securely timbered. Below the 13th level, the ground is hard and safe. At a point below the 15th level, a compound has been put in, and from the 16th level, the shaft has been sunk to the 19th on an incline of 60°, parallel to and in the foot wall of the vein. The shaft now has a hoisting capacity of 1000 tons in 24 hours.

A new shaft is also being constructed to provide for an increased tonnage and to insure a constant output in case an accident should cause the San Guillermo shaft to suspend operation. This new shaft is 25 ft. west of the San Francisco shaft and is to be completed from the collar to the 17th level in eight months. With the exception of the excavation to bedrock, practically all the work will be done by raising from the different levels, and herein lies one of the unique features of the undertaking.

The plans call for drifts at the tunnel, 11th, 14th and 16th levels, said drifts starting at points a few meters north of the San Francisco shaft and running in a southwesterly direction to the determined site of the new shaft. Upon completion of these drifts, raising will be started from each of the above levels at the same time. Steel timbering will be used throughout. The main advantages of such a shaft over one placed at a more distant point, are largely expediency and economy, since it is figured that the shaft under construction can be sunk at one-third the cost and in one-half the time. The ground in this locality is known also to contain no orebody or water, which is a highly important factor.

Under the former management, the general method of mining consisted in driving along the main vein, opening raises through to the level above at desired intervals, erecting an ore chute and manway between consecutive raises, and extracting the ore by overhead stoping, followed by square-setting and filling with waste. The great objection to the method lay in the inability to keep the main drive open due to the heavy character of the orebody and the tendency of the latter to move. Consequently forests of timber are found lining the levels. In order to keep the main drive of the 17th level open for tramming, it was found necessary to place 10x10-in. timber, side by side, along practically its entire length. This timber costs 50 pesos per thousand and has to be replaced about once a year. To eliminate continual retimbering, recourse was had in several instances to masonry, a compact rhyolitic brick being used for the purpose. While it cost 40 pesos per meter to construct this masonry, drifts of this character, opened several years ago, are still in good shape.



Method of Mining, in the Upper Levels at the Santa Gertrudis

Old Filling Ore Mined First

When the Santa Gertrudis property was turned over to the new management, a careful sampling of the old stopes showed the fill to contain ore running from 200 to 2000 grams of silver and one to 11 grams of gold per metric ton. Owing to the fact that the main orebody in the lower levels was not in a state for economical production at this time, recourse had to be had to these filling ores. Since it was necessary to start stoping at once, the method shown by the accompanying engraving was adopted.

Raises A and B were driven at various intervals through the vein material to the second level above. Midway between these raises, an ore chute and manway were constructed. Starting at the chute, drives were run in a longitudinal direction and an entire floor of ore removed for the length and width of the stope. As fast as a block of ore was cut, square sets were erected to hold the ground

and, at the same time, waste was thrown down the raises A and B from above and spread over the floor below by means of wheelbarrow and shovel. The ore was prevented from mixing with the waste by laying planks on top of the square sets. These stopes extended in vertical projection over a distance of about 200 ft., since only alternate levels were opened to reduce the costs.

The greatest expense attached to this method arises from the necessity of burying the timber. Distributing the filling material by barrow and shovel also adds to the stoping costs. The method is efficient, however, and with the present price of labor, is probably more economical than a method by which the handling of waste fill in this manner was eliminated. The heavy and dangerous character of the ground necessitates timbering and filling with the least possible delay.

Counter-drive System Used

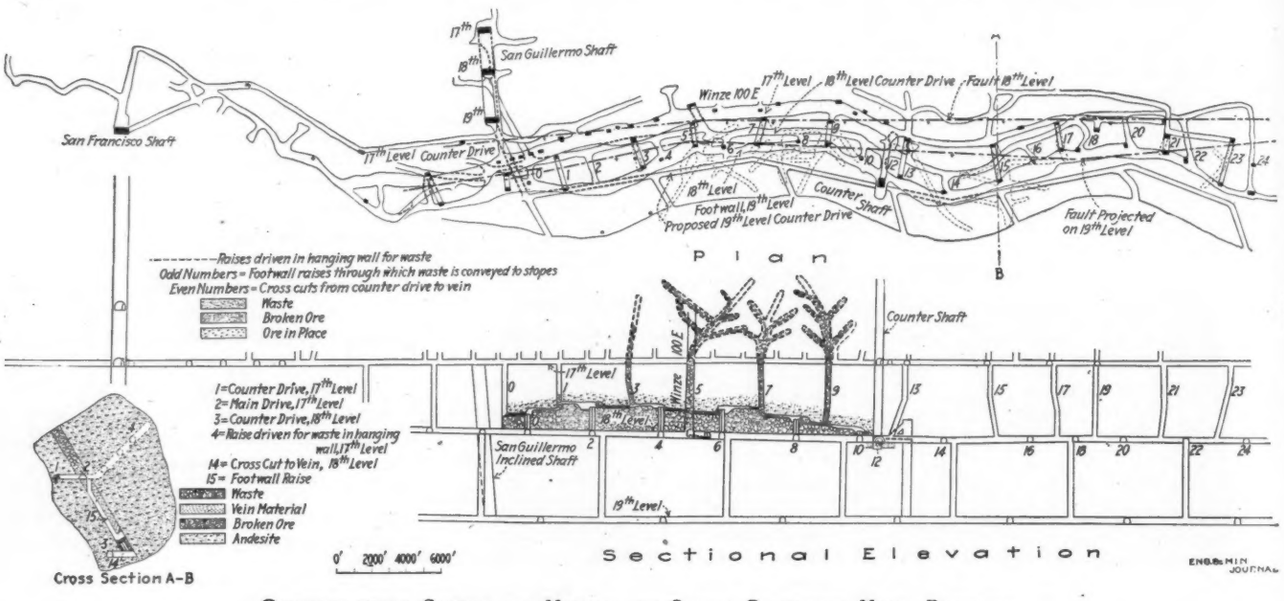
The lower levels, where the main ore production is secured, are opened first by means of a 7x6-ft. counter drive, driven in the foot wall, approximately parallel to and 25 meters from the vein. Crosscuts are run from the counter drive to the vein at intervals of 50 to 55 m., after which the sill floor is stoped and raises driven midway between consecutive crosscuts. These raises follow the foot wall of the vein to within several meters of the next level, where they cut vertically upward across the vein and intersect the upper level on the hanging-wall side. Chutes and manways are then constructed at the end of each crosscut, the sill floor is filled with waste and stoping above the sill floor begins.

Where the foot-wall raise opens on the level above, another raise is started at an angle of 45° into the hanging wall for the purpose of extracting waste for filling. At the same time overhead stoping commences directly over the ore chutes on the new level, and proceeds in an easterly direction until one of the foot-wall raises is reached. Filling from the waste raise above is then carried into the stope through the foot-wall raise and spread evenly over that portion which has just been removed. Meanwhile stoping is being continued in a westerly direction to the west foot-wall raise. When the latter is reached, waste is drawn from the same to fill the excavated portion while stoping is proceeding at the eastern half again. By keeping the fill well up to the back of the stope, no timbering is necessary except possibly when within five or six meters of the level above. At this point, the foot-wall raises have been pretty well eliminated, the ground shows a greater tendency to cave, and the matter of filling presents a few more difficulties.

When this method of mining was first proposed, engineers agreed that seven meters from the vein was sufficient distance to run the counter drive. Crosscuts were driven at intervals of 20 to 30 meters and the foot-wall raises likewise. Experience has proven that it is necessary to keep the counter drive at least 20 or 25 meters from the vein, otherwise faults and the bad character of the ground in proximity to the orebody will cause timbering, the elimination of which is one of the chief advantages of the counter-drive system. Where the foot-wall raises were driven at intervals of 20 m., the ground was so weakened that caving resulted, with the subsequent loss of the stope for several months. It has been planned, therefore, in opening up the 19th level, to kep the counter drive at a minimum distance of 25 m. from the foot wall of the vein and to reduce the number of crosscuts and foot-wall raises 50%, thus effecting a great saving in time and expense and obtaining better conditions than previously.

System has Several Advantages

The chief advantages claimed for the counter-drive system are the elimination of timbering except where the crosscut intersects the vein; it gives a well opened, firm, solid drift which will stand as long as the mine; it provides waste for the new stopes, and it is a great saver in time and money. The only argument advanced against the system is the necessity for hoisting the waste. This is accomplished at the Santa Gertrudis with little trouble and expense by means of two small shafts.



COUNTER-DRIVE SYSTEM OF MINING, AT SANTA GERTRUDIS MINE, PACHUCA

The Santa Gertrudis is the only mine in the Pachuca and Real del Monte districts employing this system. Owing to the character of the orebody, all mine superintendents find it necessary to drive these laterals sooner or later if they wish to keep their levels open without the enormous expense of timbering and retimbering at short intervals. In every instance, however, the laterals are driven long after the vein has been opened and stoped.

All ore is trammed to ore pockets on the respective levels and hoisted through the San Guillermo shaft to a 500-ton concrete pocket at the surface. It then passes on to a conveyor belt to the company's new mill, which is one of the most uptodate cyanide plants on the continent. Besides complete crushing and sampling plants, the new mill consists of sixty 1550-lb. stamps, 10 tube mills, 18 Pachuca agitation tanks, four 90-frame Merrill slime filter presses, and six 34-

frame Merrill zinc-dust precipitation presses, together with a complete equipment of auxiliary apparatus, such as Dorr classifiers, Dorr thickeners, pumps, tanks, melting furnaces, etc. Steel and concrete construction has been used throughout. An all-slime treatment is employed on ore averaging 1000 grams of silver and 5 grams of gold per dry metric ton, with an extraction of 93%. The mill is now treating 600 dry metric tons daily, but will be increased at once to a capacity of 850 dry tons per day.

Since the new management assumed charge and development work was pushed, a reëstimation of ore reserves gives: (a) 630,000 tons of positive and partly developed ore that will yield a profit of $4,610,000; (b) 520,000 tons of probable ore, $3,565,000; total estimated profit, $8,175,00. This estimate includes only the ore 30 m. below the 18th level. The width, the metal content, and the generally strong character of the orebody at this point, however, indicate the continuation of the same to great depth.

The Santa Gertrudis is controlled by the Camp Bird, Ltd., of London, which invested in holdings here when the ore reserves of the famous Camp Bird mine indicated but a short term of existence for that property. It is the present policy of the Camp Bird, Ltd., to become a holding company with valuable properties all over the world.

Shattuck-Arizona Copper Co.

For the year ended July 31, 1912, the Shattuck-Arizona Copper Co. reports the following: Wet tons of ore from development work only, 3094; equivalent dry tons, 2802; copper recovered, 1,253,305 lb.; silver recovered, 21,008 oz.; gold recovered, 13 oz. To date there has been 40,378 ft. of development work done, of which 4942 was done in the year under review, consisting of 2863 ft. of crosscuts; 938 ft of raises; 108 ft. of winzes; and 1033 ft. of intermediates.

It is purposed to build a $400,000 smeltery on a 251-acre site, adjoining the Copper Queen and Calumet & Arizona smeltery sites. This will have a nominal daily capacity of 400 tons, while it is also proposed that a 50-ton lead stack be built in addition, lead ores having recently been found on the property.

Development work has been confined to the upper levels, 300-, 400-, 500- and 600-ft. On the 300-ft. level a body of ore has been found carrying copper, 35%; silver, 25 oz., and gold, 0.05 oz. per ton. On this level also was discovered the lead ore which caused the plans for the lead stack to be considered.

On the 400-ft. level an important find of carbonate ores in limestone has been made (35% CaO), while ferruginous ores have been found on the 600 level.

The old stoping areas on the 500, 600, 700 and 800 levels have been well protected by bulkheading and waste filling, and can be reopened without heavy expense.

International Congress of Applied Chemistry

We continue, from last week's JOURNAL, our report of the proceedings of the International Congress of Applied Chemistry. On Wednesday, Sept. 11, the section of Mining and Metallurgy held a joint session with the section of Fuels and Asphalts, the program being as follows:

J. C. McDowell. Natural Gas Industrial Conditions.

A. W. Belden. The Beehive Coke Oven Industry of the United States.

O. Simmersbach. Koksofengas zur Beheizung vom Siemens-Martinöfen.

H. C. Porter and K. P. Ovitz. The Spontaneous Combustion of Coal.

J. J. Porter. Fuel Economy in the Cupola.

Harry A. Grine. Crude Oil Gas Producers of the Pacific Coast.

Norwood Johnston. The Use of Natural Gas in the Manufacture of Openhearth Steel.

The feature of the day was undoubtedly H. A. Bernthsen's lecture on "Synthetic Ammonia," with experiments. He gave a résumé of the early work on this problem, which was so discouraging that even as late as 1908 many experts declared that theory was against a solution of the problem being worked now. Now, however, said the lecturer, the walls of the first factory were arising at Oppau, near Ludwigshafen-on-Rhine, and next year synthetic ammonia would be a commercial product.

He then went into the history of the tedious search for a suitable catalyzer, and the investigation, involving literally thousands of experiments on the substances which poison the catalyzers, and spoke of the technical problems in finding substances to make the apparatus from, which must stand both high temperatures and pressures (the experiments in the lecture room were conducted at a pressure of 159 atmospheres) and the problems of getting pure nitrogen and hydrogen. But when the conditions were fulfilled, and the pure gases conducted over molybdenum, uranium, and other catalysts, under suitable temperature and pressure, ammonia is the result. The lecturer at this point, turned the delivery tube from the experimental apparatus toward a 5-liter evaporating dish of hydrochloric acid, and a column of ammonium-chloride fumes shot up to the ceiling; then turned the gas stream against a flag printed with almost invisible analine colors, and a bright-colored American flag appeared.

Doctors Eyde and Duisberg then moved and seconded a vote of thanks of the meeting to Doctor Bernthsen for his interesting and spectacular lecture.

For Wednesday afternoon, the Mining and Metallurgical section had the following papers scheduled, in a joint session with the Electrochemical and Inorganic Sections.

Horace W. Gillett. Effect of Pouring Temperatures on Tensile Strength of Aluminum Alloys.*

S. W. Parr. A New Alloy with Acid Resisting Properties.

Alfred Stavenhagen. Die physikalischen and chemischen Vorgänge beim autogenen Schnieden.*

Elwood Haynes. The Alloys of Cobalt with Chromium and Other Metals.

Wilder D. Bancroft. The Tensile Strength of the Copper-Zinc Alloys.

Otto Ruff. Ueber die Zustandsdiagramme des Kohlenstoffs mit Eisen, Nickel, Kobalt und Mangan.

Wilder D. Bancroft and T. R. Briggs. Blue Gelatine-Copper.

The paper concerning the alloys of cobalt with chromium was especially good, and will be abstracted at length.

On Thursday, Sept. 12, the section of Mining and Metallurgy met with the section on Analytical Chemistry. The program was:

The Chemists' Committee of the United States Steel Corporation, J. M. Camp, Chairman. The Methods of the United States Steel Corporation for the Commercial Sampling and Analysis of Pig Iron.

P. Mahler and Goutal. Dosage du carbone total des aciers et des ferro-alliages par combustion sans pression d'oxygen.*

William Blum. The Determination of Manganese as Sulphate and by the Sodium Bismuthieate Method.

Allen and Bishop. Method for the Determination of Sulphur in Pyrites.

J. O. Handy. Sampling and Aassying Silver Ores Containing Cobalt, Nickel, Arsenic.

F. P. Dewey. The Sampling of Gold Bullion.*

H. Milou and R. Fouret. Note sur le dosage de l'etain dans ses minerais.

Thursday afternoon was supposed to be a business session only, but later turned into an *ex tempore* experience meeting on copper smelting and refining, in which all present joined, and which was considered by the participators as one of the most enjoyable of the session.

On Friday the Congress met in joint session with W. H. Nichols, as chairman, in the Great Hall of the City College of New York, a cathedral-like auditorium capable of seating over 3000, and decorated for the occasion with the flags of the countries and foreign cities of the visiting delegates. The body accepted an invitation to meet in St. Petersburg in 1915, formally made by the Russian ambassador, and unanimously elected Dr. Paul T. Walden, of Riga, Russia, president of the ninth Congress, and Demetrius P. Konovaloff. honorary president. The former is professor of chemistry in the Polytechnic School at Riga, the latter is professor emeritus in the University of St. Petersburg, and Assistant Minister of Commerce and Industry.

*Read by title only.

There were 1483 technical, scientific and trade societies and educational institutions invited to join the congress. Of these, 233 in 28 different countries accepted and appointed 332 delegates beside the American societies and educational institutions. Twenty-five foreign governments joined, and sent 85 delegates. In addition the United States and 49 of its territorial subdivisions appointed delegates, making 75 national and state governments officially represented.

In all there were about 4500 members from all over the world, of whom 2173, representing 30 countries, attended and registered. Five hundred and thirty-five papers were presented in the sectional meetings, and 189 in the joint sessions, of which 339 were discussed in the meetings.

At the next Congress will be considered the advisability of altering the meetings to every fifth year, instead of every third, and also of adding Esperanto as an official language. It was felt that it was unfair to vote on the latter question owing to the overwhelming majority of English-speaking delegates. The proposal to drop Italian as an official language was previously killed in the section meetings.

A resolution to have the international atomic weight table published only once every five years was killed, and for it was substituted the recommendation that the international atomic weight table of 1912 be used in commercial transactions until 1915, but the International Committee will publish its table annually, for the use of scientists who must have the greatest accuracy.

The International Committee on Analysis is to consider the question of uniform methods of ore, fuel and metal sampling. The reports of this committee will be published hereafter as part of the Congress transactions. Several other resolutions of no import to the mining and metallurgical world were also passed, and two decisively beaten, after which the Congress passed a resolution approving the work of the International Commission for the Publication of Annual Tables of Physical and Chemical Constants, recommended the treasurer of the Congress audit or have audited the commission's accounts, and formally continued its life until 1915. One fine quarto volume of tables has been issued by this commission and two others are, it is understood, in press. Then after resolutions of thanks to the various officers, organizations, etc., whose efforts had made the meeting a success, the Eighth International Congress of Applied Chemistry came to an end.

Rhedium is a white metal, of specific gravity about 12.1; melting point, 2000 deg. C. Its principal use is for making thermocouple, in combination with platinum.

The Ferrocyanide Titration for Zinc

Frank Breyer, before the International Congress of Applied Chemistry, stated that the following objections held for the ordinary methods of zinc analysis. In the precipitation as carbonate, platinum vessels must be used, or else the precipitate is contaminated with silica. Weighing as sulphide is difficult as either a stream of H_2S or of hydrogen must be used in which to ignite the precipitate. It is difficult to get a pure sulphate in order to weigh the zinc as $ZnSO_4$. To weigh as phosphate means a preliminary precipitation as sulphide, and in the subsequent re-solution and precipitation losses are likely to occur. In the Na_2S titration, the standard solution is not stable.

The following method is suggested for a standard. After getting the zinc in chloride solution, add 13 cc. ammonia, neutralize with HCl, and then add 3 cc. of HCl in excess. This insures a uniform content of ammonium chloride and a uniform acidity. Dilute to 200 cc., heat to boiling and titrate with ferrocyanide, using uranium nitrate as indicator, or an iron salt as described below. Divide the solution and titrate say one-third. Over-run the end point and add almost enough excess to take care of the remainder of the solution. Add all except a few cubic centimeters of the remainder of the solution, and over-run the end point slightly. Add the remainder of the solution and titrate to the end point.

The idea of over-running the end point is this. The zinc-ferrocyanide precipitate is not of standard composition unless the ferrocyanide is in excess. Therefore to make sure of its composition, over-run the end point on the great bulk of the solution, and confine the inaccuracy to the precipitate from only the last few cubic centimeters.

Ordinarily the blue color of the zinc titration will change to pea green at the end point, and then to creamy yellow. It will always do so if there is a trace of ferrous salt in the solution and a trace of ferricyanide in the ferrocyanide solution. To secure the first a trace of ferrous chloride may be added, the last will always be present if the ferrocyanide is old, i.e., has been allowed to stand for a month or two. The same effect can be produced by adding 300 mg. of ferricyanide to the freshly made standard solution, 2 liters, but in this case the solution must be restandardized frequently when fresh.

Under the conditions given, small amounts of ferrous chloride in the zinc solution, and ferricyanide in the standard solution, the use of an outside indicator can be dispensed with, and the color taken as an end point.

Heat Losses in Furnaces

Before the International Congress of Applied Chemistry, F. A. J. Fitzgerald spoke of the importance of conserving heat in furnaces, because under ordinary conditions each 1000 Cal. was equivalent to 1.6 kilowatt-hours. One effective method of cutting down heat losses was to heat the charge as rapidly as possible. For instance, in actual work with an electric furnace, using an 88-kw. current, and consequent slow heating of the charge, the current consumption was 1.7 kilowatt-hour per kilogram of charge, while with a 93-kw. input, the consumption of current was only 1.6 kilowatt-hour per kilogram of charge.

Another method was to make the furnace surface as small as possible. With a commercial furnace heated to about 2000° C., having a surface of 80 sq.m., the current consumed per kilogram of output was 6.1 kilowatt-hours; with a similar furnace of 53 sq.m. surface, the current consumption was only 5.0 kilowatt-hours per kilogram of product.

Some experimental furnaces were made hollow cubes with 230 mm. outside edges, and 110 mm. inside. These were heated by inner coils of nichrome wire, and supported by knife edges. These conditions made comparison of various bricks possible. Silica and magnesia were poor insulators and ought to be backed by red brick, or some other insulator.

The surface, too, is of great importance; whether a clay brick was left with plain surface, painted with lamp black, or silvered with aluminum paint made a great difference in its radiating capacity. The lampblack surface radiates most freely, the aluminum-coated the least. The effect of insulating part of a furnace might be great. In a commercial furnace with 20 sq.m. of surface, run at about 1100° C., 38 kw. were required to run it. After covering 4 sq.m. of the hottest surface with building brick, only 32 kw. were required.

In the discussion J. W. Richards stated that the good effect of quick heating was self evident, but in discussing the possibilities of this, it must always be remembered that one could pile the current on a furnace in which an endothermic reaction was going on much faster than in one where the reaction was exothermic, and in comparing furnace efficiencies, the kind of reaction must be noted. Convection losses are not well understood, and in his "Principles of Thermochemistry" he had stated they were as the square root of the velocity of the air, but he had lately been led to the conclusion they were nearly as the velocity.

He had seen a most interesting thing this last summer, in the shape of some aluminum-nitride bricks, which were highly effective insulators at 1600° to 1800° Centigrade.

The Franklin Air-Balanced Hoist

The hoisting engine at the Franklin mine is so designed that the descending skip compresses air which is used in combination with steam to hoist the loaded skip. The speed of descent is regulated by the quantity of air compressed.

Note—An article entitled, "Description of an Air-balanced Hoisting Engine," by R. H. Corbett, read before the Houghton meeting of the Lake Superior Mining Institute, Aug. 28, 29, 30, 1912.

This hoisting engine was built in conformity with the ideas of R. M. Edwards, general manager of the Franklin Mining Co., and the other Dow properties in the Lake Superior copper district. Mr. Edwards long held the opinion that for deep mining operations a single-compartment shaft would be desirable, provided that a balanced hoisting engine could be built to operate a single skip or cage, he considered that the simplicity of a single-compartment shaft and its equipment would warrant any complication of the hoisting engine which would produce the desired result. It was apparent to him that if the power developed by the descending skip could be applied to compressing air it would furnish a solution of the problem.

Air Pistons Run Free While Hoisting

When the time arrived for ordering a hoist, the matter was placed in the hands of Bruno V. Nordberg to design an engine and work out the details of an air-balanced hoist to meet the requirements. Following this the engine under discussion was built by the Nordberg Manufacturing Co., of Milwaukee, Wis. This hoisting engine is a horizontal-duplex machine with the steam cylinders attached to the frames. The air-compressing cylinders are located immediately back of the steam cylinders. The air pistons are attached to extensions of the steam piston rods, the whole forming a complete hoisting engine and air compressor combined. Means are provided for allowing the steam pistons to run free while lowering the skip. The air pistons run free while hoisting. The engineer regulates the speed of the descending skip by controlling the quantity of air compressed. By means of the operating lever on the platform he absolutely governs the work done in the air cylinders between the limits of full cylinder capacity and no load.

The air compressing cylinders, Fig. 1, have four Corliss valves. The two lower ones *A* admit free air to the cylinders in the usual way. The two upper ones *B* are provided especially for regulating the capacity and are the ones controlled by the engineer while lowering. The air delivered under pressure passes through spring loaded discharge valves *C* located in the cylinder heads. The regulating valves *A* are fitted with releasing mechanism and dashpots like a Corliss steam engine. When they are open they afford a direct passage between the bore of the cylinder and the air inlet pipes through the channel *D* on top of the cylinder casting. Therefore, no air can be compressed while they are open.

To illustrate their action we will suppose an air piston is moving toward the end of the cylinder while lowering the skip. If the regulating valve is open the air in front of the piston will be forced back into the inlet pipe. If, however, the engineer trips the valve and the dashpot closes it at any desired point in the stroke, then the air left in the cylinder will begin to compress until it finally passes out through the discharge valves. The arrangement is such, that the further the engineer moves his lever the more air will be compressed and the resistance increased on the air pistons. The air cylinders are only used for regulating the speed while lowering. The usual steam-operated brakes are provided for landing the skip.

To enable the steam pistons to run free while the engine is lowering, the exhaust valves on the steam cylinders are arranged to be released from their connections and remain wide open and stationary until they are hooked up again, when the engine is reversed for hoisting. The releasing and hooking-up mechanism is connected to a small steam-operated thrust cylinder provided to furnish power for this purpose. The operating valve on this cylinder is attached to the reversing gear of the hoisting engine. Therefore, when the engineer reverses his engine the exhaust valves are either released or hooked up again as the case may be, without further attention on his part.

Air Mixed with Steam for Hoisting

While compressed air is usually in demand around a mine, it was decided in the present instance, that it would be best to mix it directly with steam from the boilers and use the mixture in the steam cylinders for hoisting the load. Three large cylindrical drums were installed for storing the compressed air along with the steam. They are each 10 ft. in diameter and 32 ft. long. They furnish ample receiver space at the present time for both steam and air.

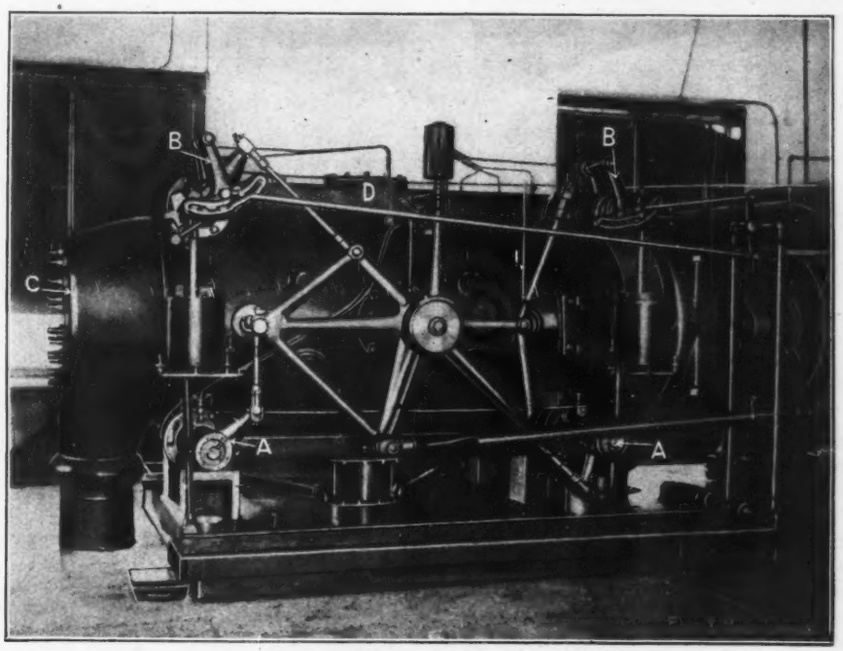


Fig. 1. Air Compressing Cylinder, Franklin Hoisting Engine

Fig. 2 is a diagram of the general arrangement showing how these receivers are connected with the boilers, air compressors and steam cylinders. A 12-in. steam pipe connects the boilers with one end of the receivers. A 16-in. pipe from the opposite end of the receivers is carried to the throttle valve. The 12-in. discharge pipes from the air compressors are connected to this same 16-in. line. This forms a convenient way for the compressed air to reach the receivers when lowering and also to supply the steam cylinders with pressure for hoisting. A reducing valve is placed in the 12-in. steam pipe between the receivers and boilers. It is set to maintain about

75 lb. pressure on the receivers. The boiler pressure is usually about 125 lb.

PRESSURE AUTOMATICALLY REGULATED

In explaining the operation of this feature of the hoisting engine, we will say that in the first place the receivers are filled with steam at 75-lb. pressure. The skip is then lowered into the mine. The air compressors begin to discharge compressed air into the receivers to mix with the steam they already contain. By the time the skip reaches the bottom of the mine the pressure will rise to 95 lb., the increase in pressure being due to the compressed air forced in by the descending skip. They will then begin to hoist the load and have 95 lb. pressure to start with. After the skip starts upward the pressure will gradually drop to below 75 lb. as the engine uses up the air stored in the receivers by the previous trip downward. The reducing valve will open after the pressure drops and steam will be taken directly from the boilers to complete the trip upward. When the hoist stops the pressure will rise to 75 lb. through the reducing valve and be in readiness for the next trip down.

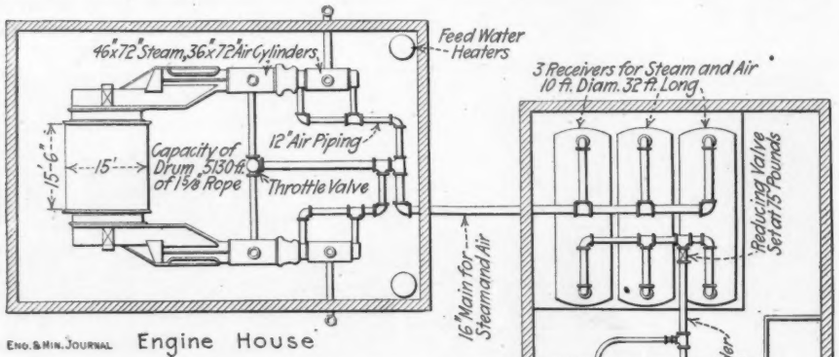

46"x72" Steam, 36"x72" Air Cylinders
Feed Water Heaters
3 Receivers for Steam and Air 10 ft. Diam. 32 ft. Long
15'-6"
15'
Capacity of Drum 5130 ft. of 1⅛" Rope
12" Air Piping
Throttle Valve
16" Main for Steam and Air
Reducing Valve Set at 75 Pounds
12" Steam Header 125 lb. Pressure
Coal Bunker
3 Fire Box Boilers 200 hp. each
Eng. & Min. Journal
Engine House
Boiler House

FIG. 2. DIAGRAM OF STEAM AND AIR PIPING, FRANKLIN HOISTING ENGINE

The following general dimensions and data is given regarding the hoist:

Diameter of steam cylinders	46 in.
Diameter of air cylinders	36 in.
Stroke of all cylinders	72 in.
Diameter of piston rods	7½ in.
Size of crank pins	12x12 in.
Size of crosshead pins	8⅝x14 in.
Size of main bearings	20x40 in.
Diameter of hoisting drum	15.0 ft.
Length of hoisting drum	15.5 ft.
Capacity of drum	5130 ft. of 1⅛-in. rope
Weight of skip	14,000 lb.
Weight of rock	20,000 lb.
Weight of rope per foot	4.15 lb.
Number of boilers required	2
Capacity of each boiler	200 hp.
Number of feed water heaters	2
Dip of shaft	40°

Berryman feed-water heaters are now being installed. The boilers are of the Lake Superior firebox type with crown and arch tubes.

The engineer handles three levers in controlling this hoist, the throttle lever, reverse lever and brake lever, the same number as on other hoists in this section. The throttle lever, however, usually stands in a vertical position when the hoist is stopped. If he pushes it from him it operates the throttle valve; if he pulls it toward him it acts on the regulating valves on the air cylinders. With this exception the hoist handles about the same as other hoists in the copper country.

Cyaniding Antimonial Tailings

The treatment of the refractory tailings produced at the mines at Hillgrove, New South Wales, has had the attention of metallurgists from time to time, but until lately the results could not be called satisfactory, reports W. Archer Longbottom (*Min. and Eng. Rev.*, May 6, 1912). The chief cause of trouble is the antimony, which is present in varying quantities in all the mines. Even after careful concentration the tailings carried an appreciable amount of this metal in an exceedingly fine state of division.

Although the antimony is present as stibnite, the consumption of cyanide is never abnormal. The chief trouble is the extraction and production of gold of good quality from the zinc-box precipitate. The stibnite is broken up in the chemical action and the antimony is encountered throughout the process. The gold is not in a free state and it is a question whether the gold is contained by the stibnite as infinitely small particles or—and this seems more probable—whether the gold is thinly coated with the stibnite sufficiently to prevent further amalgamation.

The problem resolves itself into the attacking and disintegrating of the sulphide of antimony and the freeing of the contained gold for successful cyanidation. The possibility that at least some of the gold is intimately associated with the stibnite is upheld by the fact that there appears to be a limit to the value of the residue and even the most protracted treatment will not lower the gold value appreciably. A metallurgical success is practically out of the question, though a fair commercial one can be obtained.

All the mines in operation on the Hillgrove field have cyanide plants working and, in addition, the tailings from the Eleanora mines, stacked in the early days, have already been treated by cyanidation, some of them twice, and are being put through again by W. H. C. Lovely.

These tailings have been exposed to the atmosphere for many years and are strongly acid. On the whole a neutral solution or a slight protective alkalinity is aimed at to give the most successful results. The importance of the alkalinity and acidity of the solution cannot be overestimated when dealing with antimonial tailings. If the protective alkali is in excess, antimony sulphide is taken into solution and deposited on the zinc as metallic antimony, which generally means trouble in the smelting of the precipitate. Lime is used as the neutralizer and is added in calculated quantities as the treatment tank is being filled.

The dump is worked on the opencut system starting at the middle and working toward the edges, the sand being brought up by means of an incline tramway and taken to eighteen 30-ton bleaching tanks, each 20x4 ft. The tanks are arranged in pairs with a tram line running the full length of the series. Ample sump capacity is provided by six 30-ton tanks. There are three gold tanks, each of 15 tons capacity, connected with siphons and can be used separately at will. The precipitation boxes are six in number and measure 20 ft. long by 18 in. square section. Pumping is done by two 2-in. centrifugal pumps so arranged that the material can be pumped into any sump required.

The time of treatment is seven days, including time of emptying and filling. Altogether seven washes of different strengths are run on; the strong solution first, then a weak solution and finally a quick water wash. In this treatment 100 tons of solution are pumped on the tank daily. The solution from the tank is drained to the gold sump and from there goes to the zinc boxes. The solution from the zinc boxes, after being made up to the required cyanide strength is used again. The solution is occasionally purified by the addition of some powerful oxidizing agent as potassium permanganate. Lead acetate is sometimes used to accelerate precipitation and also to throw down any sulphide there may be in solution. At regular intervals the zinc boxes are cleaned up, the precipitate and short zinc are acid treated, dried over a wood fire, fluxed with soda, borax, silica and fluorspar and melted in o furnaces, each capable of taking six plumbago crucibles, the latter being provided with clay liners.

The gold is obtained in the form of a base bullion by the use of red lead, which

is reduced by inserting rods of metallic iron. The bullion is then cupelled in specially prepared cupels, each one capable of holding 40 oz. This method has the advantage of giving remarkably clean slag. The following approximate costs of treatment are given: Labor, 2s.; cyanide, 8d.; zinc, 1½d.; fuel, 2d.; chemicals, etc., 1½d.; royalty, 1s.; total, 4s. 1d. These costs are low, the cyanide item being particularly surprising, considering the class of material being treated. All labor is on the contract system.

Manganese Steel Steam Shovel Dipper

Every part of the "Missabe" steam-shovel dippers, manufactured by the Edgar Allen American Manganese Steel Co. of Chicago, Ill., is of cast manganese steel. This fact alone insures durability and a minimum cost in repairs, owing to the toughness and wearing quality of the metal. The first three of these dippers made were put into service on the Panama Canal about one year ago; among other users are a number of large operators on the Minnesota iron ranges.

A 5-YD. MANGANESE-STEEL STEAM-SHOVEL DIPPER USED AT PANAMA AND ON THE MESABI RANGE

The "Missabe" dipper body is composed of only two castings, the front and back halves. This gives rigidity and eliminates the working and straining of the parts which, in the old style dipper built up of plates, caused loosening of rivets and frequent repairs. As shown in the accompanying halftone, the bail brackets are set at an angle conforming to the line of pull on the bail, and by putting them against projecting shoulders cast on the sides of the front casting the shearing strain is relieved from the bail-bracket rivets. Another feature is the placing of the joint, between the front and back casting, behind the bail bracket, so that the digging strain does not tend to pull the dipper apart.

The teeth are riveted on as usual, but are held unusually rigid by means of notches in the lip and offset on the outside of the lip, upon which rests that portion of the tooth which is on the outside of the lip. When extra protection for the front of the dipper is desired, a renewable bottom band and runners or shoes are furnished when desired, or they may be cast integrally with the dipper front. All pin holes in bails, hinge brackets and dipper-stick brackets are provided with renewable bushings.

Where a shovel is of high power and the digging is such as to throw great strain on the dipper it would seem that the "Missabe" dipper would give efficient and economical results. This dipper is built in all sizes for the various makes of steam shovels and dipper dredges, and is claimed by the manufacturers to have a life of three or four times that of the built-up type.

Lake Copper Co.

The report of the Lake Copper Co. for the year ended Apr. 30, 1912, states that excellent progress has been made toward preparation for regular production. Development work amounted to 12,653 ft., as against 9831 ft. in the previous year. The installation of all important equipment contemplated, has been completed and paid for.

The rock stamped by the Baltic mill, about 300 tons per day since Mar. 1, has shown a recovery of about 26 lb. of mineral per ton of rock, the mineral yielding about 60% of copper. No mine mass is included. The lode has not yet been correlated with any neighboring formation.

Giroux Consolidated Mines Co.

During the year ended Dec. 31, 1911, the Giroux Consolidated Mines Co. increased its holdings by securing two placer claims and by increasing its holdings in Butte & Ely Copper Co. to 249,575 shares out of $500,000 outstanding (par value, $1 each), according to its annual report.

During the year connection was made on the 1200-ft. level from the Giroux to the old Alpha workings, which were found to be badly caved. The 1200- and 1000-ft. levels were cleaned out, retimbered, and some drifting done, which showed good ore. On the 1200-ft. level the old workings referred to ran in ore for the full length of 160 ft., some running up to 26% copper. Drifting for 190 ft. to the south, and 90 ft. to the north of this zone also showed ore, as did drilling from the 1000-ft. level. Between the 1000- and 1200-ft. levels it is estimated that there are 25,000 tons of ore ready to stope, carrying over 10% copper.

The hard character of the ground in the Taylor and Dewey claims rendered churn drilling unwise, and development will have to be by shafts and crosscuts. However, it is believed that the orebody extends to the Pilot Knob claim, 1500 ft. away.

Efforts were made to get the Morris-Bunker Hill mine into shape for production, which necessitated a new hoisting plant at the Morris No. 2 shaft and a 3400-ft. siding to connect with the Nevada Northern R.R. The idea was to put the Giroux company on a self-sustaining basis by shipment of the porphyry ores, while developing the high-grade ores.

The fire, Aug. 23, 1911, in the Giroux shaft, cost in repairs and pumping, up to Dec. 31, $34,521, beside delaying the

production program for months. In the connections from the Giroux to the Alpha working, a great flow of water was discovered and the company is now pumping over 1,000,000 gal. per day. This will be valuable if the company erects its own concentrator or smelting plant.

It was considered during the year whether or not to rehabilitate the 500-ton Kimberly concentrator, increasing it to 1000 or 1200 tons of crude ore per day. However, to avoid delay a five-year contract was made to deliver ore at the Morris No. 2 shaft to the Steptoe company, which transports, concentrates and smelts it. It is estimated that in the Morris-Bunker Hill mine are 4,010,000 tons of porphyry ore, averaging 2.14% copper.

Expenditures for the year amounted to $269,195. No balance sheet, or financial statement, except expenditures, is given.

El Oro Report

The annual report of A. F. Main, general manager of the El Oro Mining & Ry. Co., Ltd., at El Oro, Mexico, shows that the total amount of ore broken during the year ended June 30, 1912, was less than for the previous year. The 302,742 tons mined, added to the 84,459 tons of sand tailings retreated, however, reached the limit of the capacity of the mill and cyanide plant.

In order to handle the increased tonnage in the mill and cyanide plant, due to the retreatment of the tailings, several important changes were necessary. The tailings are reground in tube mills before passing to the treatment tanks.

The percentage of actual recovery on the gold is less than for the year before, the silver recovery is greater. This is attributed to the admixture of tailings which, on account of their comparatively low grade, would not pay to work for as high percentage of extraction as would the richer ore. The silver content of the tailings seems more amenable to cyanide treatment than that of the sulphide ores from the lower levels.

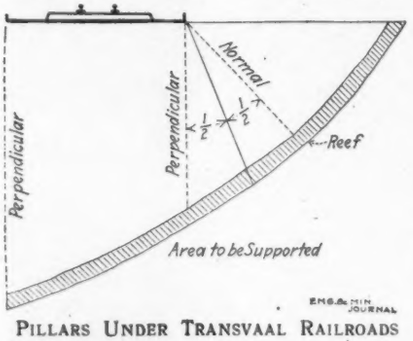
The summary of ore reserves shows 301,934 tons of ore developed, averaging $7.46 in gold and 3 oz. of silver per ton, distributed as follows: Northern orebody, 54,696 tons at $6 per ton; Southern orebody, 116,355 tons at $4.65; lower levels, 42,674 tons at $18.27; San Patricio, 88,209 tons at $6.84 per ton. It will be noted that the richest ore will come from the lower levels as has been true during the last year. The tonnage stoped during the year was distributed as follows: Northern orebody, 54,278 tons; Southern orebody, 141,458 tons; lower levels (900 ft. and below), 32,802 tons; San Patricio, 73,665 tons; and Descubridora vein, 539 tons.

The mill ran on the average of 28.91 days per month and treated 8.88 tons per stamp per 24 hours. The percentage of assay values actually recovered was, gold 87.51% and silver 74.23%, or a total actual recovery of 85.14% of the assay value. The average assay value of ore treated was gold $6.36 and silver $1.30; the average assay value of tailings treated was gold $2.68 and silver $0.88. Bullion to the total value of $2,228,190 was recovered during the year at a total cost of $3.69 per ton of material treated. The railway and lumber department showed a net profit of $120,220 for the year.

Air Blasts and Subsidences

JOHANNESBURG CORRESPONDENCE

R. N. Kotze, government mining engineer, gave some interesting particulars regarding these occurrences on the Rand at the recent annual meeting of the South African Association of Engineers. He is responsible for perfecting the railway lines running over mining areas. He states that no precautions are taken against subsidence when the roof is stoped below 1000 ft. vertical. Where the line runs parallel to the strike on the dip or south side, the area to be supported is bounded by a vertical plane from the



PILLARS UNDER TRANSVAAL RAILROADS

side of the railway reserve. On the outcrop or north side the angle between the vertical plane from the north boundary of rail reserve to the reef and a plane from the same spot normal to the reef is bisected and this area between these planes must be protected from subsidence. Where the line runs off over a coal bed a solid pillar must be left. If within less than 100 ft. of surface a solid pillar is required on the banket reefs of the Rand. Below that partial or total renewal of the ore is allowed with sand filling, packing, or waste filling, with or without pillars. These supports are ordered with regard to nature of ground, the object being to insure a gradual and regular settlement that will not interfere with the running of the line. In the past several mining companies ignored the law and secretely stoped ore, and some of these places have proved difficult to reclaim owing to falls and subsidence having already set in. Near the Geldenhuis mine today the trains slow down owing to a settlement. Where the line runs parallel to the dip, an area bounded on each side by planes 20% from the perpendicular is supported.

Of late years the inhabitants of the Rand have been subjected to shocks consisting of a single wave or vibration followed by a sound of dull thud, as distinguished from an earthquake which consists of a series of waves. Mr. Kotze considers that these shocks owe their origin to the sudden slight subsidence of large masses of ground containing millions of tons on a fault or over pillars in worked out areas. These pillars are crushed or driven into the foot walls and the release of tension causes a shock such as that seen in a testing machine when a block of stone or concrete yields.

Some so-called "air-blasts" have a similar origin, but these are mostly due to the weight at great depths, or more probably to the stresses set up by the effects of tectonic pressure caused by earth movements in the past. These have caused conditions something like that of glass in Prince Rupert drops, and when a free face is exposed by mining the rock has a tendency to crack and disrupt suddenly, mostly in smaller pieces which are projected some distance. Naturally these occurrences tend to increase in depth and have already caused serious accidents. In sinking the Brakpan Mines No. 1 shaft about the depth of 3000 ft., a band of quartzite in this state was passed through and fragments were continually breaking out with a report and being hurled about the shaft. Sinking had to be delayed until the sides could be lagged. Returning to the subject of shocks, these caused many complaints in Ophirton above the Robinson Deep mine and a seismograph was set up there. This showed that the greatest amplitude of vibration was only one millimeter, while in February, 1912, an earthquake which did no damage showed an amplitude of 11 mm., showing the shock to be unimportant at this depth, but they are more severe nearer the outcrop.

Bismuth Production in 1911

Only two lots of bismuth ore were mined in the United States in 1911, according to the U. S. Geological Survey. One was mined in La Plata County, Colo., which carried 6 to 8% of bismuth. This ore, however, was sold for its gold and silver content. Another lot of still richer ore was mined from a claim about 35 miles southwest of Tularosa, New Mexico. The imports in 1911 amounted to 172,093 lb., valued at $311,771.

According to information furnished the JOURNAL, three works produced bismuth as a byproduct in 1911, of which the United States Metals Refining Co., at Grasselli, Ind., was the largest producer. It is understood that three other plants are experimenting on this subject, and it is believed that one will be a commercial producer in 1912.

Spirally Heated Laboratory Furnace

How to build small gas fired crucible and muffle furnaces for experimenting with alloys, enamels, etc., up to temperatures of 1600° C. The furnaces are marked by simplicity and strength.

Note—Translated and somewhat shortened from an article by A. Vernueil, in Bulletin de la Société Nationale d'Encouragement pour l'Industrie Nationale, June, 1912.

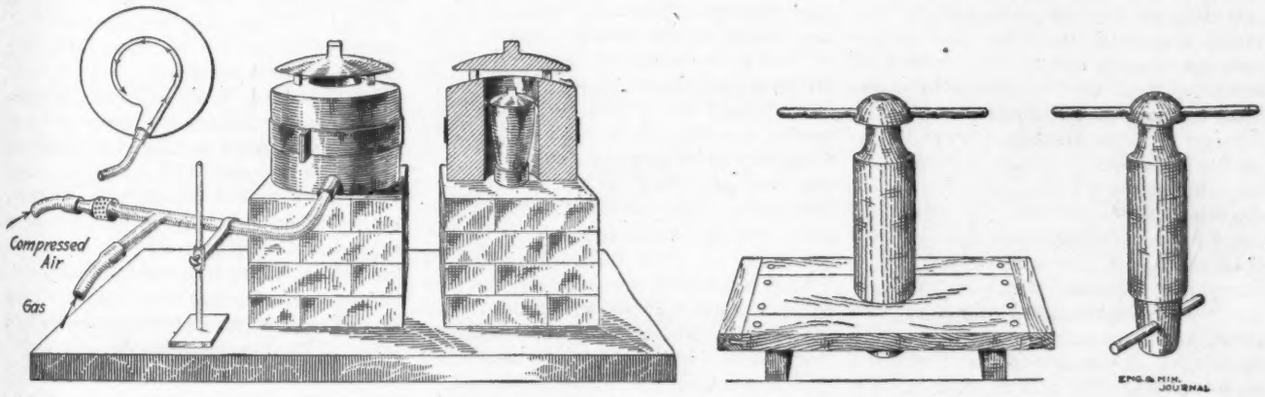
Essentially the furnace consists of a cylinder of refractory material having a thickness equal to two-thirds the diameter of the crucible space. The lower surface of the furnace rests upon a block formed of firebricks, cemented with fireclay, so as to form a plane square surface, of which the side is at least equal to the diameter of the furnace (Fig. 1). The lowest surface of the furnace is made with a semicircular canal, of which the radius of the outer opening is equal to the diameter of the tip of the burner. The outer side of the canal is tangential to the circle of the furnace opening, while the inner side diverges from the axis of the canal so as to form a funnel-shaped opening, which permits the flame to expand slightly. The direction of this canal may be turned from right to left, or left to right, to suit the gas and air connections, and it is often well to make two of these canals, one in each direction, when constructing the furnace, for it is easy to close with fireclay whichever one of the openings one wishes to eliminate.

In the upper surface of the cylinder forming the furnace walls are three small holes, two to three centimeters in depth, forming the vertices of an equilateral triangle. In these holes are fixed, with a little tempered clay, the little rods of baked clay which support the furnace cover. The space left between these rods and the furnace cover and walls allows the products of combustion to escape.

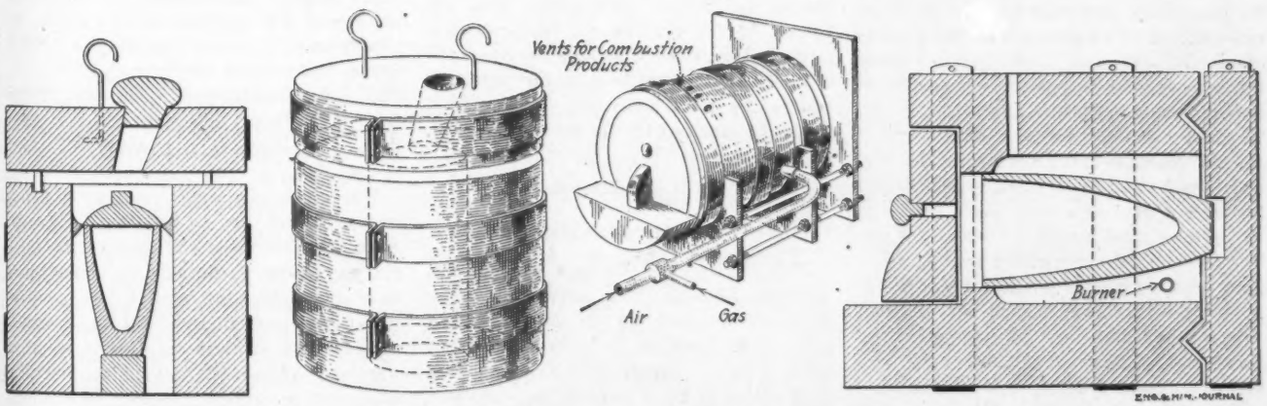
An ordinary bottle or flask of the desired size serves as a core upon which to build the furnace. Its surface is slightly vaselined, and it is then placed on a conveniently sanded table, and the furnace built up, by continuous additions of small masses of pasty refractory clay, to the form of a cylinder of the desired height and thickness. When this is complete, the core is withdrawn. It is well to leave a hole two or three millimeters in diameter at the base of the cylinder (by means of a wire, for instance), so that when the core is withdrawn the furnace will not be collapsed by pressure of the air. If one is going to construct several of these furnaces, all of the same size, it is well to make a wooden core (Fig. 2), fixed on a wooden working base with a small key.

The mixture of clay recommended by the author is that used to make the so called French crucibles, or in case one wishes to make his own mixture: Work up Normandy fireclay, 100 parts; the same fireclay, calcined and then crushed to 16-mesh, 100 parts. Another mixture given is Normandy fireclay 100 parts; the same, calcined and screened to 16-mesh, 80 parts; old glass-work's pots, crushed to 16-mesh, 80 parts, mixed with enough water to make a paste. [A fine quality American refractory clay will, of course, be substituted in this country.—EDITOR.]

After the furnace is nearly dry, which takes from 15 to 21 days at ordinary temperatures, or three or four days at 40° C. after the first "sweating out" of water, the semicircular canal spoken of above is cut out with a rasp, and the edges rounded to make it less susceptible to accidental shocks. Although the cylinder is



CONSTRUCTION OF GAS-FIRED LABORATORY FURNACE



SPIRALLY HEATED LABORATORY GAS FURNACES

ready, after being well dried, for use, it is preferable to give it a preliminary drying at a dull red heat.

Drying at Red Heat

This operation renders the fire cracks on the interior much less important, and is very well done in a makeshift furnace a little greater in diameter than the mold to be dried. This is built of ordinary brick, on a set of grate bars. About a 4- or 5-cm. layer of coarsely crushed brick is placed on the grate bars, and on this is placed the furnace mold, which is filled with and surrounded by charcoal. This is burned slowly until the form attains a dull red, after which the fire is allowed to burn out. After burning, the furnace may be bound together with one or more strips of sheet iron, riveted as shown in the illustrations.

In the author's work he used three furnaces, suitable for 200-gram, 800-gram, and 2000-gram crucible charges. One should select the size of crucible in advance, and make the inside of the furnace only four to six millimeters more in diameter than the crucible. Damming back the gas in the lower part of the furnace helps to get high temperatures. As the shrinkage in making is 8 to 10%, for a furnace to take crucibles 67 mm. in diameter, the mold is 80 mm., allowing for 7-mm. shrinkage, and an annular space of 6 mm. If a bottle cannot be found just the size, it can be wrapped with a sheet of zinc, etc., to give the required dimensions. For height, allow again 10% shrinkage and about 10 mm. over the height of stand, crucible and cover.

To avoid shrinkage cleavage, withdraw the core immediately after modeling, and make the three small holes in the top immediately, but wait several days before turning over the furnace to cut the semicircular canal. For the author's furnace, 73 mm. diameter by 150 mm. high, a No. 19 crucible cover serves as the top, and it is heated by a small-size Schloesing burner bent at a right angle (see Fig. 1), with a total length of about 50 cm. The interior diameter of the iron tip is 10 mm. The air pipe is 4 mm. interior diameter. The crucible stands on a small fireclay pedestal, and is supported by three small pieces of fireclay bent over the rim of the crucible.

Starting the Furnace

The Schlösing burner should be started under a light air pressure with the burner tip three or four centimeters from the opening. When the furnace begins to grow hot, place the tip two or three centimeters inside the opening and pointing very slightly upward, and lute it in with a little yellow clay. One then gives the required air pressure on the burner for the temperature he wishes to attain, and then turns on the gas until the flame barely shows at the opening of the furnace. The author says with a blast pressure equal to 18 cm. of mercury, the temperature reached is 1460° C.; 19 cm., 1490° C.; 20 cm., 1530° C.; with 25 cm., about 1610° C. With blast at 20-cm. pressure, about 1400 liters of illuminating gas are burned per hour.

The Larger Furnaces

The 800-gram furnace takes a crucible 113 mm. in diameter and 155 mm. in height. The furnace after burning is 260 mm. high, 290 mm. external diameter, and 123 mm. internal diameter. The cover is provided with hooks for lifting, and a small hole for pyrometer observations. A 13-mm. Schlösing burner heats it.

The largest model is used for work on artificial rubies, etc., and takes a crucible of 130 mm. diameter and 230 mm. high. The furnace is 360 mm. high, 320 mm. external diameter, and 138 to 140 mm. internal diameter, and is fired with a 19-mm. Schloesing burner. In Figs. 4 and 5 are shown almost self-explanatory cuts of muffle furnaces, on much the same principle as the furnaces above described. The author has found with ordinary muffles that they would crack at the high temperatures he wished to work with, and that the admission of the products of combustion gave radically different results than he obtained in regular technical work. In using the round muffle he finds that cracking occurs rarely, and that using a crucible about 96 mm. in diameter, and 165 mm. high for the muffle, he has ample room to experiment on glazes, enamels, the fusibility of materials made into Seger cones, etc.

In modeling this furnace, a recess is left in the back a trifle larger than the bottom of the crucible to be used as a muffle. The crucible slides into this until it binds slightly. The crucible must, of course, be luted in front. Combustion products pass out by six or eight 10-mm. holes at the top.

New Chinese Currency

The Ministry of Finance of the new Chinese Republic has adopted preliminary articles defining the new currency plan. The standard is to be gold, based upon a dollar containing 0.75 gram pure gold. This is equivalent to the Japanese yen, and will be equal to $0.498 United States gold. No present provision is made for gold currency, but silver dollars are to be coined weighing 22 grams.

Four classes of subsidiary coins are provided. The first will be of silver and nickel, and will include pieces of 50 cents, weighing 13 grams; 20 cents, weighing 5.2 grams, and 10 cents, 2.6 grams. The second class will be of brass and nickel and will include 5-cent coins, weighing 5 grams. The third class will be of brass, lead and tin and will include 1-cent pieces weighing 6 grams and 5-cash pieces, 3 grams. The fourth class of brass and lead, will consist of 1-cash pieces, weighing 1.25 grams. One dollar will be equal to 100 cents, or 1000 cash.

The consular report, from which these particulars are taken refers to "brass," but this word probably means copper.

Effect of New Mining Legislation on the Rand

Johannesburg Correspondence

Trouble is threatened between the members of the miner's union and the mine owners on the Rand owing to the introduction of a new agreement by the companies with their contract workers. According to the Conciliation Act, the companies must give one month's notice before altering the condition of employment and during that time the miners may call for an arbitration commission to investigate any grievances. The truth about the new agreement appears to be that the mines have been badly hit by recent legislation. In connection with the eight-hour day, I wrote that I considered it would be impossible to make natives do as much work in eight hours as in nine, and inquiries from some of the largest mines show that the efficiency per boy in shoveling and tramming has fallen off about ¼ ton per day. Another mine manager considered that the act had raised costs about 10%. This law provides for an eight-hour day at the face, and the miners seem determined to press for an eight-hour bank-to-bank day, which would about render many mines unworkable. On top of this comes a heavy capital expenditure in order to ventilate the mines and provide water services and the payment of compensation to sufferers from miner's phthisis which may cost anything from 6d. to 1s. per ton for some years.

The mines have made some small economies by not paying the one-half shift extra for Saturdays and making the miners pay compensation to natives injured by their breakage of regulations; but they suffer greatly from unskilled and drunken employees who move from mine to mine, wasting explosives, damaging machines and spoiling working faces. This shortage of efficient and steady miners is due, of course, largely to the neglect of the mine operators, and of the men themselves, to check the ravages of phthisis. The new agreement seeks to protect the miners in several particulars and perhaps indirectly to reduce the large checks which must be paid to the best men.

I do not think that the trouble will lead to a strike as the miners know they are helpless without the engine drivers and these workers occupy a favored position they would be loath to forfeit.

Caving System in Chisholm District-III

By L. D. Davenport*

Square sets are used in the iron mines at Chisholm, Minn., where the upper surface of the ore is rolling and makes up into the capping for a short distance, then drops again. The manner of using square sets is described in detail.

*Engineer, Oliver Iron Mining Co., Mesaba, Minn.

In the Chisholm district of Minnesota, square-sets are used where the back of the ore above the top level is of a rolling nature, or where the ore runs up to a considerable height, 20 ft. or more, for a short distance, and then drops down again. It would, in some cases, be possible to put up raises close together and slice out the area, but the cost of the raises and the additional drifting, would increase considerably the cost of the ore. Moreover, by using the square sets, it is possible to get the ore out at once, whereas, if slicing were used, it would first be necessary to put up raises and to drift before stoping could be started. Furthermore it would be difficult to obtain good ventilation in a slice under these conditions.

Much Ore Tied Up in Square-Set System

When square-set work was first used in the Hibbing district, it was started on the main level, and carried up to the top of the orebody, sometimes for a height of 16 sets. Rooms were worked out three sets wide, one set on each side of the drift and 50- to 60-ft. pillars were left between. The principal objection to this method of working, was that it tied up too much of the ore, since it necessitated leaving these large pillars between the working places and it was not possible to slice out these pillars until the square-set work had been finished.

Square sets are used at present only where the ore is too high for one slice and does not have sufficient extent to warrant taking it out in two or more slices. The work as done here is sometimes called square-set slicing, since as a rule two tiers in width are taken, and then the room is boarded up and blasted down as in a regular slice.

Method of Starting a Square-set Room

In starting a square-set room, the first bottom set or open set *A*, Fig. 1, is put in the drift, the caps are lined up so that the set stands perpendicular to the line of the drift, with the posts plumb. In all cases, the timber is hitched into the ground and firmly wedged, the caps bearing hard against the tenons of the posts as shown in Fig. 4. The top of *A* set is lagged at the sides, leaving an opening of about 18 in. at the center, which is covered with short pieces of boards laid perpendicular to the lagging.

With *A* set in place, a cutting-in-hole is put up in the back of *A* to break the ground for the first raise set as shown in *B* set Fig. 2. Before blasting the first raise set, *B*, a short piece of rail, shown in Fig. 4, is propped under the lagging to steady it, and to take the weight of the blast. After the blast the prop is knocked out and the car is run under the set some of the short boards are removed and the dirt run in the car. *B* set is squared up and trimmed out, just enough to allow the timber to be put in place and wedged. The top of *B* set is not lagged before *C* set is blasted, but the dirt from the cutting-in-blast of *C* set drops on the lagging of *A* set. *C* set is blasted and squared up in the same manner as *B* set.

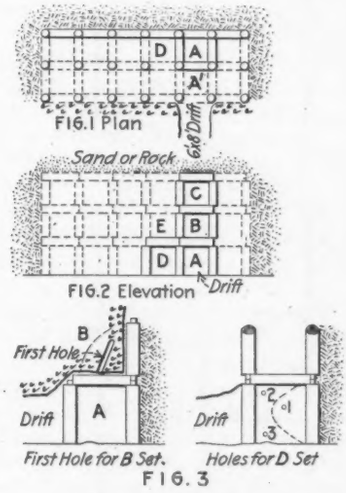
If *C* set is the top set, supposing the room to be only three sets high, the top is lagged and the back blocked and wedged solid. No side lagging is necessary. Next, the ground for *D* set is blasted (see Fig. 3) squared up, and the timber put in place and wedged in the same manner as *A* set. Lagging and short boards are used in the top of *D* set, as they were in *A* set, except that the lagging runs parallel to *A* and *D* sets, i.e., perpendicular to the drift.

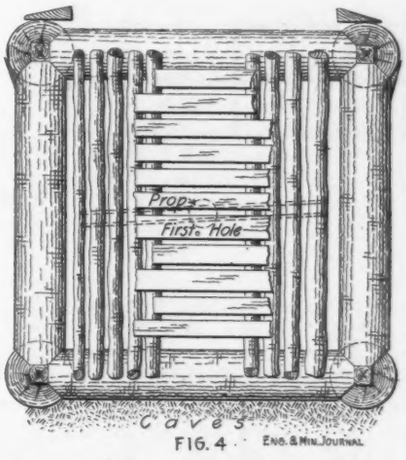
The track is turned so that the car can be run into *D* set and then *E* set, on top of *D* set, is blasted. This *E* set is blasted and squared up from *B* set in the same manner that *D* set was worked from *A* set, on the bottom. The work is continued in the same manner, i. e., the bottom set is put in first, and then the raise sets as before, until the first tier is finished.

Rooms Are 50 Ft. Long

Usually a room six sets long (50 ft.) is worked, one set on one side of the drift, and four on the other. With the first tier in place, another open set is put in the drift against *A* set on the bottom, and then raise sets above that, and the tier continued in the same manner as the first tier. *A'*, *B'*, *C'*, etc., are put in in exactly the same manner as *A*, *B*, *C*, were; only *B'* is blasted from *B* instead of from the bottom set.

The track runs along the bottom set of the first tier and in working out the second tier, slab chutes are sometimes used to carry the dirt into the car, as shown in Fig. 7. Ordinarily a room six sets long and two sets wide is blasted down when working against caved ground. When a room is finished it is boarded up, starting at the top. Usually the two upper tiers are boarded. All the lagging used is dropped to the bottom of the room and used to lag up the bottom sets. The lagging is placed vertically, the upper ends bearing against the inside of the caps, and the lower ends against the poles which extend from post to post along the floor of the room as shown in Fig. 5. The floor of the room is covered with a single layer of boards.





Details of Square Set Timbering Used in Chisholm District

Props Used Between Posts in Upper Sets

In boarding up the upper tiers, props are put in between the posts from cap to cap, and make a bearing for the boards as shown in Fig. 6. After the

room is boarded up, the drift is breasted up. Timber is put across the end of the drift and hitched into the ground against the open set. Diagonal braces are placed against the posts to steady them.

In Fig. 6 is shown the usual manner of placing the holes in blasting down a square-set room. At *A*, *B* and *C*, in Fig. 6, the caps are left across the room. By leaving these caps they act as props, and allow the room to fill up without disturbing the timber against the solid ground.

In heavy ground, where the sides of the old room are broken up or part of the timber is missing, it is usual to drop back one set from the caved ground, as at *A'* set in Fig. 1, and to take out a full tier up to the back, and from cave to

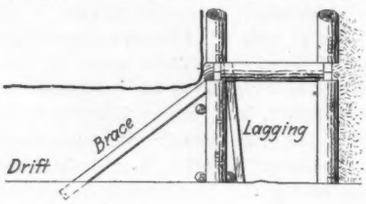


FIG. 5

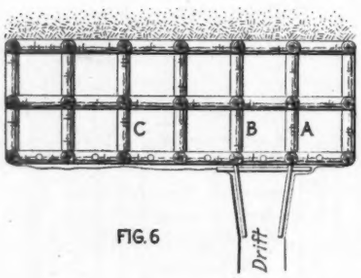


FIG. 6

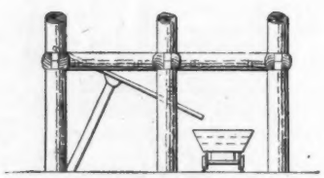


FIG. 7

FURTHER DETAILS OF METHODS OF TIMBERING WITH SQUARE SETS

cave. Then starting at the top, for safety, to put in the top sets between the new tier and the caved ground, then to carry the timbering down. In this way, the back is secured before the pillar between the tier and the caved ground is taken out. This pillar serves as a protection between the new tier and the caved ground. The new tier is boarded up before a start is made on the new pillar. It is sometimes necessary to cross-brace the top sets in order to take the weight of the back and the side pressure of the caved ground as shown in Fig. 8. In working out this pillar, sometimes a post or two is missing, as the ground is timbered down, these missing posts are put back.

PILLAR LEFT BETWEEN DRIFT SLICE AND SQUARE SETS

In starting square sets against a drift slice, a small pillar is always left between the square sets and the drift slice

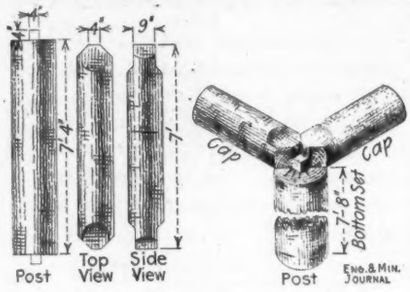


FIG. 10. JOINT USED WITH ROUND SQUARE-SET TIMBERS

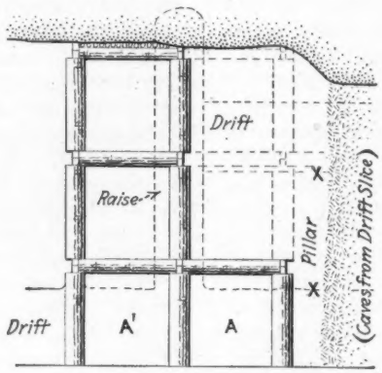


FIG. 9

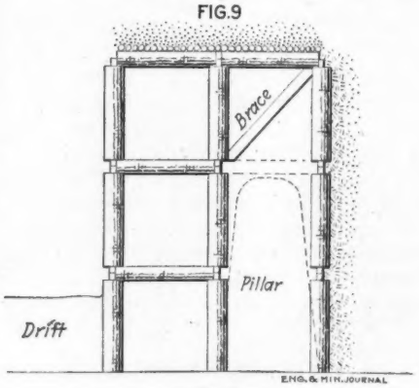


FIG. 8

as shown in Fig. 9. It is usual, also, to put in *A* set and *A'* set first, and then finish the tiers at *A'* as in the case of heavy ground, and then take out the pillar, still leaving a small pillar *X*, Fig. 9, which is taken out after the room is boarded up. *A* set is called an open set or starting set; *B* and *C* sets are called raise sets. All other top sets are called drop sets. A solid set is a set in solid ground. A side set is one with an open side to break to in blasting.

The London *Mining Journal* reports that Franz Fischer, in Leipzig, Germany, has succeeded in producing iron, 99.99 per cent. pure by an electrolytic process. The metal fuses at 1600 deg. C., and can be rolled or drawn without difficulty.

Oregon Metal Production

The value of the mine production of gold, silver and copper in Oregon in 1911, according to Charles G. Yale, of the U. S. Geological Survey, was $669,016, against $700,676 in 1910. No output of lead or zinc was reported in either 1910 or 1911. The production of gold decreased from $679,488 in 1910 to $633,407 in 1911. Gold output from deep mines decreased $43,430 and that from placer mines decreased $2651, compared with the output of 1910.

The production of silver increased from 39,978 fine oz. in 1910 to 45,221 oz. in 1911. Of the silver, 34,011 fine oz. was derived from siliceous ores, 9953 oz. from copper ores, and the rest from placer mines. The copper ore shipped to smelters amounted to 4205 tons, having a copper content of 93,136 lb. This indicates an average recovery of 22.2 lb. of copper per ton. The average recovery of gold and silver from copper ores was $3.32 per ton.

Baker County led in gold production, with an output of $389,786, of which $372,405 was derived from 74,558 tons of siliceous ore and from tailings. Of the silver production of 45,221 oz., over two-thirds came from Baker County.

There were 40 deep mines and 136 placer mines operated in Oregon in 1911. Of the placer mines 88 were hydraulic, 3 dredging, 9 drifting and 36 sluicing properties.

Cryolite

No cryolite is produced in the United States, according to the U. S. Geological Survey, the entire supply used in this country being imported from Greenland. The quantity reported to have been imported for domestic consumption in 1911 was 2007 long tons, as compared with 36 long tons in 1910. Cryolite is imported free of duty.

Cryolite has been found in commercial quantities only at Ivigtut, an Eskimo hamlet on the southern coast of Greenland in latitude 61° N. Minerals containing cryolite have been found near Pikes Peak, Colo., but not in paying quantities. The deposit at Ivigtut is reported to be a solid mass having surface dimensions of about 200 ft. by 600 ft., and it has been worked as an open cut to a depth of about 150 ft. The deposit widens with depth, and the depth is unknown.

Formerly cryolite was used to produce soda and alum, but other and cheaper sources of these materials have displaced cryolite from this particular field. The more important uses at present for cryolite are in the metallurgy of aluminum, in the manufacture of opaque glass for the enameling of iron ware, and as a flux in the manufacture of white portland cement.

NEW PUBLICATIONS

THE BUSINESS OF MINING. By Arthur J. Hoskin. 5x7¾, pp. 224, illus. J. B. Lippincott Co., Philadelphia, Penn.

MACHINE DESIGN — HOISTS, DERRICKS, CRANES. By H. D. Hese. 6¼x9½, pp. 368, illus.; $5. J. B. Lippincott Co., Philadelphia, Penn.

RHODESIA CHAMBER OF MINES, SEVENTEENTH ANNUAL REPORT: 1911. 7x10 in., pp. 128. Buluwayo, Rhodesia; published for the Chamber of Mines.

INDEX OF MINING ENGINEERING LITERATURE. Vol. II. By Walter R. Crane. 6x9¼, pp. 461. John Wiley & Sons, New York.

COMMISSION OF CONSERVATION, CANADA. Report of the Third Annual Meeting, 1912. Clifford Sifton, Chairman. Pp. 154, illus. John Lovell & Son, Montreal, Canada.

THE PRODUCTION OF PETROLEUM IN 1911. By David T. Day. Advance Chapter from Mineral Resources of the U. S., 1911. Pp. 152. U. S. Geological Survey, Washington, D. C.

ANNUAL REPORT OF THE BRITISH COLUMBIA MINISTER OF MINES, FOR THE YEAR ENDING DEC. 31, 1911. Pp. 313, illus. Richard McBride, Minister of Mines, Victoria, B. C.

STRENGTH OF MATERIALS. A Text-Book for Secondary Technical Schools. Sixth edition, revised. By Mansfield Merriman. 5½x7¾, pp. 188, illus.; $1. John Wiley & Sons, New York.

DIE ELEKTROLYTISCHE ALKALICHLORIDZERLEGUNG MIT STARREN METALLKATHODEN. Teil I. By Jean Billiter. 6¾x9¾, pp. 284, illus., paper; 16.50 marks. Wilhelm Knapp, Halle a. S., Germany.

PRELIMINARY REPORT ON THE CLAY AND SHALE DEPOSITS OF THE WESTERN PROVINCES. By Heinrich Ries and Joseph Keele. Pp. 250, illus. Memoir 24-E, Canada Department of Mines, Geological Survey Branch, Ottawa.

INVESTIGATION OF THE COALS OF CANADA WITH REFERENCE TO THEIR ECONOMIC QUALITIES AS CONDUCTED AT McGILL UNIVERSITY, MONTREAL, UNDER THE AUTHORITY OF THE DOMINION GOVERNMENT. By J. B. Porter and R. J. Durley, assisted by T. C. Denis, Edgar Stansfield and assistants. Volume II. Pp. 189, illus., $1. Canada Dept. of Mines, Mines Branch, Ottawa, Ont.

TRANSVAAL CHAMBER OF MINES. TWENTY-SECOND ANNUAL REPORT: 1911. 7x10 in., pp. 513. Johannesburg, Transvaal; published for the Chamber of Mines.

Besides the report of proceedings of the Chamber of Mines and the statistics of production this volume contains several reports and papers of interest. Included in these are notes on current legislation and its effects on the mining industry; on patents; on explosives; on the sanitation of mines; on miners' phthisis; and on the supply of native labor. The importance of the last named question is seen by the fact that 208,858 negroes were brought to the mines during the year, of which 202,212 were discharged on expiration of their contracts. There was also a "wastage," which included 3672 men deserted and sent to jail and 3677 died. The handling of this army of recruits was no small work, and the Native Labor Association, as the labor branch of the chamber is called, was busily employed.

PRACTICAL FIELD GEOLOGY. By J. H. Farrell and Alfred J. Moses. 5x7½, pp., illus., flexible leather; $2.50. McGraw-Hill Book Co., New York.

This book differs in many respects from the usual run of pocket- or handbooks. In the first place, the author of its descriptive portion combines a wide experience in practical matters with an intimate acquaintance with the doctrines and writings of the scientists; hence the book is neither a catalogue of disconnected facts nor a judicial treatise on the merits of opposing theories. The familiar facts are there, of course, accurately crystallized but so smoothly waterworn by the stream of the discussion as to lose their sharp corners. Practical hints and theoretical deductions often elbow one another in the same paragraph.

The first five chapters describe, without excess of detail, the field methods for surveying both topography and geology. For this work the author strongly recommends the plane-table, with stadia measurements. Chap. VI, on general suggestions, outlines the scope of an investigation, and proceeds to discuss the personal equation of a geologist; his advice here is to collect data carefully and systematically and then to digest them at leisure. He does not believe in working under forced draught. Chap. VII, on interpretation of geological data, sets forth the problem that has to be solved by every engineer engaged to pass on the value of a mining property, and the next chapter illustrates methods of solving fault problems graphically.

Chap. IX is a verbatim reprint of the paper by J. W. Roe on the application of descriptive geometry to mining problems, and is a valuable section of the book. Chaps. X and XI review the leading theories of ore deposition and secondary enrichment, quoting the authorities, but the author gives a very practical bearing to the discussion by postulating a number of cases of ore occurrence, and then deducing the probable behavior of the several deposits at depth. These chapters form a most valuable exposition of this puzzling subject. Chap. XII classifies the rocks and gives a concise table by which to assign the proper name to any ordinary rock, relying only on its visible characteristics. Chap. XIII contains valuable hints on the equipment necessary for a geological survey, and includes a paper by S. K. Bradford describing methods by which an engineer in a desolate locality can make assays, roughly but with sufficient accuracy for his immediate needs, with materials which can be carried in a suit-case. Chap. XIV discusses the features of outcrops, and XV the methods of recording drill-hole data.

Of the guide to the recognition of common or important minerals, by A. J. Moses, it is only necessary to say that it is of the same high order of excellence as the same author's more extended treatise on mineralogy. By means of the scheme of classification it is possible to identify any ordinary rock-forming or ore-forming mineral by nothing else than its hardness, its color, and the color of its streak. As a further aid in doubtful cases, a set of 50 simple blowpipe tests is tabulated, the appropriate ones for each mineral being indicated. These require no elaborate paraphernalia.

The book is nicely printed and conveniently bound. As is often the case with first editions, a few typographical errors slipped past the proofreaders. For example, the "interruption" of geological data, on page x of the table of contents, and two flannel "skirts" along with socks and trousers (p. 203) as part of the equipment for a geological expedition.

HIGH EXPLOSIVES. By W. R. Quinan. 5x7, pp. 210., illus., cloth; 21s. Critchley Parker, Melbourne, Australia.

This book contains an excellent treatment of a practicai matter in a scientific manner. Its author, while at West Point, distinguished himself in physics and mathematics, and this book, which was written shortly before his death in 1910, proves that his talents for close reasoning and mathematical demonstration never diminished during a long period actively devoted to the practical management of explosives works in California and South Africa. The book says nothing about the manufacture of explosives, nor even mentions the composition of more than half a dozen of them. It is confined strictly to a discussion of the physics involved in explosions, and here the author reviews the experiments and theories of his predecessors and colleagues, criticising their fallacies and praising their merits with impartiality and discernment.

Among the topics discussed are the velocity of detonation (a review of an important paper on that subject by A. M. Comey), the peculiarities of modern dynamite and gelatine, theory of explosive energy, available energy and useful work of an explosive, strength (or pressure) developed by explosives, theories of explosion and of dissociation, detonation of gaseous mixtures, dissociation of explosives (taking nitrogylcerine as an example).

Only here and there, and then mainly as incidental to the discussion, appear hints helpful to the ordinary user of explosives. Yet the book cannot be said to be lacking in practical value; its suggestions need only to be translated from the language of mathematics to that of the mining camp. Had the author been spared a little longer he doubtless would have rounded out his book with a chapter or two having this aim. In its appearance, the book is marred by a good many printer's errors, transposed or missing lines, etc., and in the mathematical portions especially the composition is below the standard set by the best bookmakers.

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

V. H. Hughes has been appointed assistant state geologist of Missouri.

R. Hay Anderson left London, Sept. 11, for New York on his return to Mexico.

B. Hochschild, president of the American Metal Co., has returned from Europe.

P. Jensen, general manager of the Simau mines, Lebong Tandai, Sumatra, is visiting the United States.

W. R. Bolley has been appointed superintendent of the Baltic copper mine, in Michigan. The position is a new one.

Prof. George W. Schneider, of the Colorado School of Mines, has been examining mining property in Clear Creek County.

William F. Deaner has resigned the position of superintendent of the Original Amador mine, at Amador City, Calif., and has gone to Utah.

Hugh Park is in charge of operations of the Nipissing Mining Co., Ltd., of Cobalt, Ont.; during the absence of the manager, R. B. Watson.

William J. Priestly, Jr., has resigned as superintendent of the Rhodes Hall mine, Fairbanks, Alaska, and has gone to Brigham City, Utah.

E. M. Hamilton is at Cobalt, Ont. He will assist in the final preparations and also in the initial run of the new mill of the Nipissing company.

E. W. Beidler, of Cleveland, Ohio, was recently in Cobalt, Ont., looking over the Alexandra mine, on Diabase Mountain, which will probably be reopened.

W. D. Waltman is now general manager of the Franco-Wyoming Oil Co., and vice-president of the Natrona Pipe Line & Refining Co. Address, Caspar, Wyoming.

W. L. Fleming, of New York, is visiting the Cobalt district, in Ontario, looking into the latest developments with a view of ascertaining the continuation of ore at depth.

W. Ray Cox is leaving the Doe Run Lead Co. at Flat River, Mo. He has been appointed mineral inspector for the General Land Office, with headquarters in San Francisco.

R. B. Watson, manager for the Nipissing Mining Co., Ltd., of Cobalt, Ont., is in Germany taking the baths in an effort to relieve himself of rheumatism, from which he suffers.

William Schwanhauser, chief engineer of the International Steam Pump Co., has returned to New York from a three months' trip to Europe, visiting England, Germany and Russia.

John F. Soares, electrical engineer, has resigned from the employ of the Yuba Construction Co., and has gone to Europe to engage with H. C. Peake in the construction of gold dredges.

Bernard McDonald was a recent visitor at Cobalt, Ont. He left on Sept. 7 for New York, whence he will return to Los Angeles, Calif., where he is making his home during the unsettled conditions in Mexico.

Harry G. Peake, a former superintendent with the Yuba Construction Co., and now chief engineer and part owner of the Union Construction Co., of San Francisco, is in Europe engaged in dredge construction.

W. J. McGee, general manager of the Lincoln Consolidated mines, which include the Lincoln and the Wildman-Mahoney, at Sutter Creek, Calif., has returned from a trip to Canada and to several cities of the United States.

S. R. Heakes, a mining engineer and one time manager of the Kerr Lake mine at Cobalt, Ont., was ordained a member of the Anglican clergy, at London, Ont., Aug. 25. Mr. Heakes will serve as curate of the Cronyn Memorial Church of London.

Walter Douglas, who was reported captured in Sonora, escaped through the rebel lines south of Cabullona Sept. 11, and arrived at Agua Prieta safely. With a companion he fled on a railroad motor velocipede, which the two men had to carry past two bridges destroyed by the insurrectos.

B. Magnus, general manager of the Electrolytic Refining Co., at Port Kembla, Australia, has been appointed general manager of the Mount Morgan Gold Mining Co., at Mount Morgan, Queensland. He will also continue to supervise the operations at the Electrolytic Refining Co.'s works.

A dinner, in remembrance of Edmond Fremy, the great French chemist, was given at the Union League Club, New York, Sept. 11, by his students and friends—August Aulard, Gabriel Bertrand, Leon Bourgeois, Louis Bartheleny, Emile Gaillard, Victor Watleyne and George F. Kunz. A number of delegates to the International Congress of Applied Chemistry were present. The vegetables, salads and chicken served were supplied from Mr. Kunz's farm.

OBITUARY

John Barry died at Los Angeles, Calif., Aug. 4. He had been engaged in mining in the Southwest for many years, and was one of the pioneer prospectors and miners in Mohave County, Arizona.

John Livingston Grandin died at Battle Creek, Mich., Sept. 11, aged 76 years. He was born and brought up at Tideout, Penn., and was one of the earliest operators in the Pennsylvania oilfield. He drilled the first oil well in the Warren County district.

J. W. Skeele died at his home in Madison, N. J., Sept. 17. He had had a wide experience in the anthracite trade and was one of the best known men in that trade. For a number of years he was connected with the Philadelphia & Reading Coal & Iron Co., and about 1892 he went to Coxe Brothers & Co. When that concern was consolidated with the Lehigh Valley, Mr. Skeele became a director of the Lehigh Valley Coal Co. and afterward its vice-president. When the business was reorganized recently, he became president of the Lehigh Valley Coal Sales Co., which took over the selling and marketing end. Few men were as well posted on the history and conditions of the anthracite industry.

George W. McClure died at Pittsburgh, Sept. 4, aged 76 years. He was head of the contracting firm of G. W. McClure, Son & Co., largely engaged in blast-furnace and steel-mill construction. He was born in Pittsburgh, received his early education in the public schools and when 22 years old became a contractor. His first work in the blast-furnace line was with the firm of Lyons & Schaub, in the Allegheny mountains. Later he built blast furnaces for John H. Schoenberger and James Wood, pioneers in the iron industry. Mr. McClure kept himself informed on all improvements pertaining to the manufacture of iron and steel, and was instrumental in bringing into use a number of changes in blast-furnace construction which are now being used all over this and other countries. He had extensive experience with the different methods of heating air for blast-furnace practice from the old system of cast-iron pipe stoves down to the present method of heating air through fire-brick hot blast stoves.

Societies and Technical Schools

American Mining Congress—The fifteenth annual meeting has been called, to be held at Spokane, Wash., Nov. 25-28. The annual meeting of members of the incorporation will be held Nov. 26. The general convention will be composed of the regular members of the American Mining Congress, together with all duly accredited delegates who are appointed under the authority hereby extended for the appointment of delegates as follows: The President may appoint ten delegates at large; Chief Executives of foreign nations 10; governors of states and territories 10 delegates; mayors of cities and towns, two, and one additional delegate for each 100,000 population; boards of county commissioners, or supervisors, two; boards of trade, two; chambers of commerce, two; mining bureaus and exchanges, two; mining organizations, two; scientific societies, two; engineers' associations, two; state mining schools, two delegates each.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Sept. 10—The new steel No. 10 dredge of the Natomas Consolidated of California is expected to be placed on the trial run in the present week. With the hanging of the bucket line the dredge will be ready for actual trial operation. The actual field construction work, which consisted of laying the hull, was begun in April this year, making a total of five months for construction. Considering that the design and construction of this dredge is in many respects a wide departure from the practice that has heretofore obtained, the work has been carried on with unusual expedition. It is true that the Yuba Construction Co. has had large practice in the construction of placer-gold dredges, and the unusual advantage of being directly connected with the W. P. Hammon interests as a part of the combination of dredge builders and operators. The success of the Yuba Construction Co. and of the Union Iron Works Co. which are the leading gold-dredge builders in California, is due to the careful organization and the selection of engineers and other workmen. There are two conditions which Mr. Hammon seems to have insisted upon, at least tentatively, in the conduct of the construction department of the interests he established. One affects the labor employed, the other, more directly perhaps, the engineering department and the supervision of field construction. The provision for the sustenance of the men in the construction camps is not surpassed in any camp in California, and is probably unequaled in most camps both in this state and elsewhere. The result is that both the skilled and the unskilled labor is above the average in accomplishment. The more important condition applies to the engineering department. It has apparently been the practice of the company to not only advance men in position, but what appears to be of equal importance is the practice of keeping men of experience continually in the employment of the company. The departure of the Hammon interests from the wooden hull and gantrys to the all-steel construction was evidently advanced by the destruction of the wooden hull and other wooden parts of No. 8 dredge by fire. But the expedition with which the steel construction in No. 8 and No. 10 have advanced is due very largely, if not wholly, to the fact that the company has in its employ men trained to this class of work.

The Weaverville board of trade will ask the government to apply to the construction of a 10-mile road down Trinity River from North Fork to Big Bar $20,000 of the $27,000 appropriated for roads and trails in the Trinity national forest. By this diversion of that amount of the appropriation a connection will be made between Trinity and Humboldt counties which will become a part of a proposed highway on which about $200,000 of state and county money has already been expended. Humboldt County agrees to do its share toward such a highway. This road would be of great benefit to the mining industry in both counties.

Denver

Sept. 13—The American Mining Congress was organized in Denver 15 years ago and eight years ago when in session at Portland, Ore., it was decided to make Denver its permanent home. At that time Salt Lake City tried hard to get it, and offered $50,000 and two central city lots as an inducement. At the November convention in Spokane, Wash., Salt Lake City will make another effort to capture the permanent headquarters. If Denver wants to hold it, the least it could do would be to meet the original Salt Lake City offer and build a home for the congress in this city. After Denver has made the American Mining Congress into the powerful institution that it is, it would be most regrettable if its home were moved elsewhere, but it looks as if this city would have to do something in order to hold it.

Denver mining-machinery manufacturers say the sale of their products has been greater during the last few months, than for many years. This is attributed largely to the steady advance in the price of silver and other metals. The strangest occurrence, however, is that Eastern and foreign bankers who formerly were afraid to have their names associated with the mineral industry, are now becoming interested in high-class gold and silver producers in this state. Three syndicates of Eastern bankers now have their agents and engineers here conducting negotiations and examinations.

The Rothbert Steel & Iron Co. was organized in Denver in June and announces that it is ready to erect a plant for the manufacture of its product, and that if the chamber of commerce will give the company assistance it will build a plant here having a capacity of 20 tons per day, costing $150,000. The company would manufacture high-grade steel from titaniferous magnetite, of which there is an abundance in this state.

Butte

Sept. 11—Several officials of the American Smelting & Refining Co., have been visiting the East Helena smeltery with a view to enlarging the plant and making it one of the principal smelteries of the company. The party consisted of Karl Eilers, of the New York office, and Walter T. Page, manager of the plant at Omaha, both of the executive committee, and J. C. Redmond, of the New York office. Accompanied by Frank M. Smith, manager of the East Helena plant, they left for the Cœur d'Alene district in Idaho Sept. 8 and will continue on to the coast from there.

With the remodeling of the main hoisting engine of the principal mines of the Anaconda company, for the use of air in the place of steam, the company also made efforts to operate the chippy, or auxiliary hoisting engines, in the same manner. With the large hoist it was found necessary to greatly enlarge the cylinders, but it was believed that the smaller hoists could be operated with the same cylinders used for steam. This was tried at two or three of the properties, but it was discovered to be unsatisfactory for the most part, and at length a number of engines, especially constructed for the use of compressed air, were ordered from the Nordberg company. The cylinders of these new engines are 28x48 in. inside, the diameter of the cylinder being much larger in proportion to the length of the stroke than is the case with steam, due to the fact that the air pressure is from 15 to 35 lb. less than steam pressure. The engines are built to hoist from a depth of 2800 ft. One of these has been installed at the Tramway mine, and was started Sept. 7. Another is being put in place at the Diamond mine, and as fast as they arrive from the factory they will be installed at the High Ore, Mountain View, Leonard, Pennsylvania, and others of the company mines. The Pennsylvania mine is still closed down, but preparations for hoisting with compressed air have been nearly completed, and the mine will be reopened in a few days. The shaft is being sunk, three compartments wide, and has now reached a place below the 1900-ft. level. A station will be cut on the 2000-ft. level and exploration work started at that depth.

Salt Lake City

Sept. 12—At a meeting of mining men held at the Commercial Club Aug. 2, the advisability of forming an organization to look after the mining interests of the state was considered and discussed. The question as to whether it would be better to act through the American Mining Congress or to have a separate organization was brought up and a special committee appointed to find out the sentiment of mine owners and operators throughout the state. This committee polled the state by postal vote, and found the preponderance of opinion for an independent organization, working in conjunction if possible with the American Mining Congress. A call has been issued for a general meeting of mine owners and operators to be held at the Commercial Club Sept. 14 for the purpose of completing the plans for the organization of an Independent Association to handle matters of importance to the mining industry. This organization is to be composed especially of metal mining men. The need of such an organization became evident when the tariff on lead and zinc was reduced in the Underwood bill in the last session of Congress. Utah lead operators were assured that unless they could demonstrate to the satisfaction of Congress that their industry required protection, basing their contention on actual statistics of production, costs, etc., the tariff would be reduced. A further need for concerted action was shown in the necessity for securing a more favorable interpretation of the mining laws by the Department of the Interior in the matter of locating and patenting mining claims, as illustrated in the East Tintic Consolidated case. Another matter to be looked into is the present taxation system of the state, whereby mining companies are more rigidly taxed than any other Utah industrial companies. The mining, milling, and smelting industry is the most important in the state, and has been without means of concerted action to protect its interests. The association to be formed is expressly for this purpose.

Isolated coal fields in Uintah and Wasatch Counties are described in *Bull.* 471-L. of the U. S. Geological Survey. The Deep Creek district of the Vernal coal field is of an area of approximately 25 square miles, and is on the south slope of the Uintah Mountains, west of Green River. The nearest railroad station is Dragon, distant 100 miles by wagon road. It is estimated that this field contains 49,000,000 tons of coal. The Blacktail Mountain coal field in Wasatch County is about 35 miles west of the Deep Creek district and away from railroad lines. It can be reached from Park City or Heber, a distance of about 50 miles. The coal beds occur in two groups. The higher in the Mesaverde formation, which contains at least 21 coal beds in a stratagraphic distance of 1650 ft. The lower group is in the Mancos shale, 3500 ft. below the upper group, and contains four known coal beds in a distance of 250 ft. There is estimated to be 1,857,600,000 tons. The development of the field depends on the settlement of the Uintah basin, and the extension of railroads to that part of the state. The coal in both fields is bituminous.

Negaunee, Mich.

Sept. 13—Preparations are being made to re-open the Michigan gold mine situated five miles northwest of Ishpeming and one mile north of North Lake. The property, consisting of 260 acres of land with a small mining equipment and mill, is owned by the Michigan Quartz Silica Co. of Milwaukee in which several Ishpeming men are interested. An option to purchase 40 acres and the equipment for $22,500 has been given to another company for which Morgan Wright, of Marquette, late geologist for the Vermilion Land & Iron Co., is superintendent; $2500 was paid for the option to explore, which will expire in one year. It is planned to thoroughly test the 40-acre tract under option which has been opened up by three exploratory shafts of which the deepest is about 100 ft. deep. The property was formerly operated for quartz which is the sales product of the Michigan Quartz Silica Co., but it was found that similar material could be obtained nearer Milwaukee, and the plant was closed down. Small quantities of gold have been recovered from the Michigan mine at various times. It is situated in the same periodotite belt as the old Ropes gold mine three miles to the northeast, which produced $650,000 between 1882 and 1897.

Kingman, Ariz

Sept. 12—M. W. Musgrove, who is promoting the project for a dam and power plant on the Colorado River, north of Kingman, has again gone to New York to confer with the men whom he has interested in his plans. Mr. Culbertson, the consulting engineer for the proposed company which has the project under consideration, is also *en route* to New York. It is stated that the data collected by him upon his recent trip from Pierce's Ferry to Needles will enable him to present the undertaking in a favorable light. The magnitude of the venture will, of course, necessitate exhaustive consideration of all conditions attendant upon the construction of the proposed plant, the present chief apparent difficulty being the damming of a stream with the characteristics of the Colorado. The present need of cheaper power in the adjacent district and the rapid development of the district even under existing conditions, however, gives promise of ample reward to men who have the initiative and nerve necessary to carry the project to completion.

The affairs of the late O. & C. Development Co. were wound up in Kingman recently by the sale of the Buick truck which was seized under attachment by several local creditors. The failure was chiefly due to lack of a sufficiently intelligent preliminary examination of the property and the consequent requisition of an insufficient amount of funds to place the project upon a self-supporting basis.

Toronto

Sept. 13—The first of the prospectors who went to look for diamonds in the vicinity of James Bay has returned without finding any stones. A sample of diamond matrix was, however, brought back and the geological conditions are said to be favorable for the discovery of diamonds. This party was in the precise locality where a number of stones were reported to have been found a year ago. The country is a difficult one to get into, and the discouraging results of this first party will tend to damp the ardor of other prospectors.

Cobalt

Sept. 13—A small rush has taken place to Auld township which lies a comparatively short distance from Cobalt and is reached by boats on the Montreal River. Several silver finds of importance are reported to have been made and active mining operations will be started shortly.

Gowganda is flourishing and can claim three producing mines, with several prospects that are well worthy of development. The most noticeable increase in activity has, however, been in Cobalt. No less than 27 properties having been reopened during the year and negotiations are under way for the reöpening of several others. The high price of silver and the continued prosperity of the Cobalt mines, is answerable for this activity.

Porcupine

Sept. 13—One of the most disturbing factors that the Porcupine operators have to face at present, is the shortage of labor. Despite the fact that wages paid in this district are as high or higher than the average in western camps, the supply of labor is entirely inadequate. So pronounced has it become that some of the larger companies are sending scouts between Cochrane and North Bay to find more men. It is probable, however, that this condition will right itself during the next two or three months. Outside of the operating mines, there is little work going on in the vicinity of Porcupine, and many of the men have drifted to other parts. The western harvests have drawn a considerable number, and in addition there is much railway construction going on.

The Mining News

The Current History of Mining

Alaska

KETCHIKAN DISTRICT

Polson and Ickus will resume the development of their copper-gold prospect on the north arm of Mallard Bay, Prince of Wales Island.

The London men who bonded the Martin Buggy gold property, near Smugglers' Cove last spring, have driven two tunnels to intersect the orebody. They are now enlarging the camp, in order to continue development with a larger force.

The Lhote and Sanford property adjoins the Victory on the south and in it five oreshoots, from 5 to 14 ft. wide, have been developed. The ore contains principally copper with a fair quantity of gold and a little silver. Development work consists of 420 ft. of tunnel, a 70-ft. shaft and surface stripping. An unusual feature of this property is an occurrence of barite, which, from present development, appears to be of sufficient size and purity to become of commercial value.

Gold Stream—A 5-stamp mill has just been put in operation on this property, on Gravina Island, three miles from Ketchikan; A. A. Wakefield, manager.

Lon De Van—A 2040-ft. crosscut was driven to cut the vein at a depth of 1000 ft. and about midway between the two best surface showings. The vein was found within 4 ft. of its assumed position, and is 24 ft. wide at that place. Driving has been done for a distance of 1021 ft. along the vein, which is 4 to 24 ft. wide. The ore so far found will require concentration. The ore contains gold, silver, lead and zinc. E. F. Moore is superintendent.

It—This property will resume shipments. Mining and development work is in progress. The long tunnel started last year is being continued. J. C. Barber is engineer in charge.

Moonshine—This is a silver-lead property upon which much work has been done. It is on Cholmondeley Sound, on the east coast of Prince of Wales Island. Some development work is now in progress. It is the intention of the owners to place the property on a shipping basis during the next year. W. W. Catlin is manager.

Copper Mountain—The Duluth men, who now control this property, on the west side of Prince of Wales Island, and which was formerly owned by the Alaska Copper Co., have had their engineer on the property since last January. Surveying and surface prospecting has been done. It is understood that the results have been satisfactory; that the wharf and other structures will now be repaired, and that further development of the property will be undertaken. R. L. Kilpatrick is the engineer in charge.

Alaska Industrial Co.—This property, which continued its shipments during the panic of 1907, is still a regular producer. Charles A. Sulzer is manager.

Arizona

GILA COUNTY

Inspiration Consolidated—The extension of the main line of the Arizona Eastern R.R. from Miami up Keystone and Live Oak gulches to the Inspiration tunnel and the Live Oak mine was started last week. There was 4900 ft. of underground development work done in August and the rate is increasing.

South Live Oak—Churn-drill hole No. 3, reported to be in commercial ore, is 780 ft. deep.

Southwestern Miami—The enlargement of hole No. 8 to 6¼ in. size by underreaming has been finished and drilling will be resumed.

Irene—J. A. Fleming has taken a lease on this silver mine in Irene gulch, about two miles north of Globe. The group consists of nine claims and has silver-bearing veins in quartzite, diabase and limestone. The mine was a producer of high-grade silver ore in the early "eighties."

Iron Cap—The company has just shipped a car of oxidized copper ore to the Old Dominion smeltery. Another car is now being loaded. The ore is coming from the shoot recently opened on the 650-ft. level. Drifting continues east on the ore at this level and a drift has just been started east on the 800-ft. level to cut the same shoot. There are 12 men employed. F. A. Woodward is manager and H. W. Woodward, superintendent.

Arizona Commercial—The Copper Hill shaft is now completely re-timbered and enlarged to three compartments from the collar down to the fourth level, where a pump has been installed and is being operated by compressed air from the Old Dominion power house. The shaft and workings below that level are now being unwatered preparatory to re-timbering and enlarging the shaft below the 400-ft. level.

MOHAVE COUNTY

Tom Reed—The Lovin & Withers Co., of Kingman, has a contract for hauling two carloads of pipe from Kingman to Oatman, for a water line from one of the large springs in the mountains above the mine to the mill.

Union Basin Mining Co.—This company, operating the Golconda mine, reports that shipments of zinc ore last month totaled 1070 tons, which was more than 500 tons more than the amount shipped during August, 1911. It is expected that the shipments will soon average 1400 tons per month, as the company is positive of the ability of the mine to produce that quantity. At present, there is some lack of facilities for freighting the ore from the mine to the railroad, at Mineral Station. The main shaft has reached a depth of 420 ft. and the tunnel through the Prosperity claim, which is intended to make connection with the shaft, will probably be under the shaft within a month. From this place a raise of about 70 ft. will have to be made to reach the shaft.

Frisco—The regular fortnightly bar of bullion, valued at about $7000, was recently received in Kingman. The company is reported to be milling ore which averages about $12 per ton with an ultimate extraction of nearly 90% of the gold.

De la Fontaine—Lead and zinc ore is being freighted from this mine, on Stockton Hill, to Berry, for shipment to the smeltery. The present shipment will amount to about 100 tons.

Distaff—Charles E. Sherman, of Chloride, has leased this mine to men who are now working the property. A winze has been sunk 100 ft. from the adit level and drifts are being driven on the vein, from the bottom of this winze. It is reported that in 30 ft. of the winze, 15 tons of rich ore was recovered.

SANTA CRUZ COUNTY

R. R. R.—A winze is being sunk on the vein and is now 90 ft. below the tunnel level, and a drift has been started at a place 60 ft. below that level. The sinking of the 375-ft., two-compartment shaft will be continued to the tunnel level, a distance of about 600 ft. Six machine-drills and 70 men are employed. W. S. Sultan, superintendent.

Bradford—The Copper Queen company, after an examination by its en-

gineers and by Walter Douglas, the general manager, has taken over this mine belonging to the Ferry estate. The property is three miles west of the R. R. R. mine and one mile west of the Amster spur at Bloxton. About one car of copper-carbonate ore is being shipped each week.

Chief—This group of claims, owned by Bracy Curtis, president of the First National Bank of Nogales, William Powers and others, has been bonded to El Tigre men, and a 500-ft. crosscut tunnel has been started. The claims are 1½ miles northeast of the R. R. R. mine and adjoin the Worlds Fair mine owned by Frank Powers. The ore carries copper, lead and zinc.

California

Alpine County

Curtz Consolidated Mines Co.—It is reported that the company has secured control of water rights, stamp mill and concentrators, and that an electric power and lighting plant will be installed. Three shifts are employed, and the miners are accepting 50% of their wages in stock of the company. George Hauschild, of Hayward, is president.

Amador County

Plymouth Consolidated—The Pacific shaft is unwatered to below the 1200-ft. level. The lower workings contain comparatively little water. The shaft is 1650 ft. deep.

Zeila—The winze, being sunk near the end of the north drift on the 1500-ft. level, is showing ore that, from appearances, is of better grade than has been milled. It is being tested by mill runs. W. T. Detert, manager.

Mountain King—The deposit in this claim, at Pine Grove, is 3 ft. wide and has been disclosed for a length of 15 ft. and a depth of 15 ft. The ore is sorted and only the rich free-gold streaks are crushed in the hand battery. This discovery has attracted prospectors to the East belt, and good prospects are reported.

Reward—The mill has been idle for lack of water. Crammer brothers, owners.

Stud Horse—The mill will again be placed in commission as soon as there is sufficient water.

Butte County

W. J. Organ, 85 years old, recently relocated a claim on the middle fork of Feather River, which he originally located in 1850. It is in the Berry district, where some promising prospects have lately been found.

An appropriation of 49,000,000 miner's inches of water in the middle fork of Feather River has been filed with the county recorder by F. G. Ebey and others. The purpose is to generate electricity for mining power.

Poodle Dog—A rich streak of ore is reported to have been found at this mine, near Hurlton. Biggs brothers, of Oroville, are owners.

Calaveras County

Hardy-McCreight—The unwatering and cleaning out of the tunnel and winze of this mine, formerly known as the Hardy, on Chaparrel Hill, near the Tulloch mine, is nearing completion. A 50-gal. bucket is used. James Maltman and son, of 331 Bush St., San Francisco, have a purchase bond. The mine is said to have produced about $60,000 in the early days. Hobart and Lane once owned and operated it. The tunnel is 150 ft. long, the winze 110 ft. deep. The tunnel has been cleaned and retimbered and car tracks laid. The mine has been idle for 15 years.

South Carolina—The 10-stamp mill is nearing completion. John J. Pierano, of Carson Hill, is superintendent.

Dolling—A shoot of ore has been disclosed in the winze to a depth of about 20 ft. Good ore is also found in the west drift. D. G. Overall, of Angels, is superintendent.

Lightner—The shaft has been deepened to 1000 ft. A fair quality of ore has been disclosed in the 900-ft. level. The shaft will be sunk to the 1200-ft. level, where another drift will be driven. B. C. Clark, of Angels, superintendent.

Eldorado County

Bright Hope Mining Co.—A 12-ft. lode has been exposed in the 80-ft. shaft. The tunnel, which is expected to tap the vein at a depth of 215 ft., is in 700 ft. J. N. Lawson, of Georgetown, is president.

Nonpareil Mining Co.—E. H. Callahan, of San Francisco, one of the owners of the Virner mine, is making preparations to reopen this property.

Fresno County

Peacock—This is a new location of a copper prospect, on the west side of Copper Creek, which flows southward into Kings River cañon. Gold and silver also have been found. Charles A. Ryan, of Fresno, locator.

Coalinga-Mohawk—The well is producing 1000 bbl. of 30° oil, which is reported to be contracted to the Standard at 60c. per bbl. The well is only 400 ft. deep.

Humboldt County

A tungsten deposit is reported to have been discovered at Horse Mountain, by D. W. Stapp, of Eureka. Development will be undertaken.

Red Cap—The installation of machinery is about completed at this mine, 30 miles north of Hoopa. The installation consists of a 1500-ft. aërial tramway from the main orebin to the 10-ton Gardner crusher. The mill and concentrators are driven by water power. Earl Swan, C. W. Hayden and others, of Scotia, are owners.

Horse Mountain Copper Mining Co.—It is understood that this company will take over the Ruby Copper property of 33 claims on Horse Mountain, that was acquired by David Wilson, general manager for the company.

San Bernardino County

Desert Mining Co.—This company is operating the Edie placer property, seven miles southeast of Kramer, by the Macartney method of dry washing.

Siskiyou County

Reeves-Davis—The season cleanup has been made. One pipe will be kept working to pipe off the overburden until the rainy season. The flume is being repaired, which work will occupy about two months. The mine is near Happy Camp.

Tuolumne County

Green—A pump, engine and boiler, to be installed at this mine, near Confidence, have been received at the Sonora depot of the Sierra Ry. Active development will immediately follow the installation. John Ryan and associates are the owners.

Climax—Work is expected to be commenced soon by N. T. Nelson, of Los Angeles, who has a purchase option.

Colorado

Clear Creek County

Oneida—The foundations for the new 50-ton cyanide plant are under construction. The mill building and the cyanide equipment will be furnished by the Hendrie & Bolthoff Manufacturing and Supply Co., of Denver. Sufficient ore has been developed in the property and careful tests have been made to justify the erection of the mill. John Owen and H. T. Rogers, of Idaho Springs, are the owners and managers.

Hoosac—Excavations are now being made for the foundations of the new 10-stamp amalgamating mill. The plant will be erected near the portal of the Hoosac tunnel at Fall River station on the Colorado & Southern Ry. The mill will be supplied and built by McFarlane & Co., of Central City, and will have a capacity of 50 tons per day. The Hoosac properties are being developed under the local management of H. C. Perks.

Millington—This property, near Lawson, has been reopened and is being developed and operated by lessees. Small shipments are being made. The ore contains gold, silver and lead.

Independent—This mining and leasing company has a five-year lease on the properties of the North American

Smelter & Mines Co. which include the Donaldson, Centurian, Magalona, Kelly, Harrison and others. These properties are south of Clear Creek and along Trail Creek and Spring Gulch. Extensive development work has been undertaken, some of which is resulting in shipments of ore. From the main Donaldson level west from the Rockford tunnel a 500-ft. shaft is being sunk and is now 100 ft. deep. This shaft has opened a vein of gold ore. At present two Leyner drills and four Waugh stopers are in use. Other equipment will be added. Twenty five men are employed. The company has a well equipped power house on Clear Creek and a convenient railroad loading station. John Larson, of Idaho Springs, is president and manager.

LAKE COUNTY—LEADVILLE

New Monarch Mining Co.—From the Cleveland and Winnie claims of this company the production during August was 101 cars of medium-grade ore. Manager Watson says it is his intention to resume work in the New Monarch shaft and prospect therefrom in virgin territory. He is employing 80 men.

Penn—The output from the shafts on Breece Hill is 60 tons daily of good-grade ore. Manager Joseph Lamphier states that the output has been largely curtailed by the great influx of surface water, but this is now drying up and he expects to ship 100 tons daily from now on.

Boston Group—Manager Evans, of this group of claims at the head of Mayflower gulch in the Ten Mile mining district, reports the opening of ore rich in lead and carrying gold and silver. The work is done through a tunnel driven into Gold Hill and this is said to be one of the biggest strikes ever made in the district. The property is owned by Smith & Templeton, of Chicago and New York.

Eureka Mining Co.—In August this company shipped 26 cars of second-class silver-lead ore from the new strike in the Columbine shaft. Several cars of first-class ore were also shipped.

Siwatch Tunnel—About 4000 ft. from the portal a vein of silver-bearing iron sulphide was recently opened 700 ft. below the surface.

SAN JUAN REGION

Red Mountain Railroad Mining & Smelting Co.—The properties of this company in a receiver's hands for the last year were sold at the court house, Ouray, this week to J. F. Thompson, of Long Beach, Calif., for $175,000.

Black Bear—The entire property of this company, including mines, mills, tramways, reservoirs and water rights, is to be offered at sheriff's sale at Telluride, Sept. 30, to satisfy judgments amounting to $100,000.

Primos Chemical Co.—The miners' bunkhouse on this company's properties on Bear Creek was completely destroyed Sept. 6, by fire.

Tomboy—During August the mill was in operation 28 days, crushing 9500 tons of ore, which yielded $33,500 in bullion and $57,000 in concentrates, a total of $90,500. The operating expenses for the period were $46,500, and the expenditures on permanent improvements, $10,345.

Wanakah Mining Co.—During July the mill was in operation 29½ days, crushing 1246 tons of ore. The concentrates produced were worth $19,472, and 213 tons of ore were shipped, worth $4552. The total income for the month was $24,024, and the total operating expenses were $7288; the operating profit was $16,736.

TELLER COUNTY-CRIPPLE CREEK

Henry Adney Estate—A strike of ore yielding 6 oz. gold per ton without sorting, is reported in the Little Bessie claim on Beacon Hill.

El Paso Consolidated Gold Mines Co.—The par value of the stock has been increased from $1 to $5 per share, the total number of shares reduced from 2,500,000 to 500,000 and the offices of the company authorized to list the shares on the New York Stock Exchange. At a meeting of the directors, a dividend of 10c. per share was declared on the new stock payable Oct. 31, a total for the quarter of $45,000 as 50,000 shares are still in the treasury. With this dividend the dividends paid will total $1,597,295 and for the current year $159,250. The cash balance to date is $150,000. Net mill returns for July and August average $45,000 each month.

Mary Cashen—A 30-hp electric hoist has been installed. An extensive plan of development has been outlined.

Pharmacist—The output for August by F. Matha, lessee, was three carloads of mill ore from a new shoot lately opened.

Union Leasing Co.—Twenty-four carloads of mill ore were shipped in August; 11 cars from the Gold Sovereign on Bull Hill and 13 from the Gold Dollar on Beacon Hill. The company has been mining in the district for 10 years.

Free Coinage—The output for August from the Pinto shaft was 21 carloads of mill ore. There are 15 sets of lessees working on the property.

Joe Dandy—James H. Peabody, lessee on this mine on Raven Hill, shipped in August 800 tons of ore, most of which came from the 550 level.

Elkton—The August output was 3000 tons of a bullion value of about $50,000.

Mary McKinney—The output for August was 40 carloads, most of which came from the ninth level where the shoot has been developed for 600 ft. in length. The company is paying dividends regularly.

C. K. & N.—From this mine, on Beacon Hill, the output for August was 25 carloads.

Idaho

BONNER COUNTY

Idaho Continental—Construction work was begun recently on the new mill of this company, near Porthill.

IDAHO COUNTY

Mill-site grading is under way on the property of Hazlett & Trader, in the Dixie district.

Snowstorm—Besides considerable surface prospecting work, a tunnel has been driven for 60 ft. on the vein, on this group of quartz claims, near the Center Star, on the south fork of Clearwater River. Leslie Belor is owner.

Center Star—In the face of the tunnel the vein is as wide as the excavation. The tunnel is 500 ft. long and the face is 300 ft. below the surface. Messrs. Murphy, Brown and Tiedman are the owners.

Crooked River Placer Mines Co.—This company, owning placer claims on Crooked River, and the south fork of Clearwater River, will soon begin hydraulicking. A small force of men has been employed in repairing the ditch since last May.

Penn-Dixie—The mill is about ready to be placed in commission. The equipment includes a 4-stamp mill, 30-hp. boiler and engine, two concentrators and cyanide equipment. Provision has been made for the installation of six more stamps. S. R. Gayton, Dixie, is manager.

Majestic—At these mines, near Dixie, machine drills are being used in driving tunnels, the rate of progress being about 21 ft. per week.

Oversight—Development work has resulted in the discovery of rich ore on this property, owned by Robinson & Cox.

Michigan

COPPER

Calumet & Hecla—Shaft No. 18, the most northernly shaft on the Osceola lode, is developing good ground; drifts have been extended from the second and sixth levels to the Centennial boundary line and stoping has been done.

Indiana—This company continues sinking its shaft at the rate of about 60 ft. per month; the shaft is about 1075 ft. deep, the objective point being the felsite formation that was revealed in the drill cores at a depth of about 1400 feet.

New Arcadian—This company has moved a complete surface equipment from the old workings to the site of the new shaft and everything is in readiness for sinking. The shaft is about 100 ft. deep.

Lake—Lateral openings are being extended at all the levels on the main lode below the fifth and on the so called east lode, which is about 150 ft. from the main lode at a place between the third

and eighth levels. Shipments of about 400 tons are being made to the mill.

Wolverine—Production so far has surpassed that of last month and barring some unforseen delays, that of September will surpass that of August in all respects. The management gives the conservative life of the property at from 15 to 20 years more, and the property has the record of being the cheapest producer on the Lake.

Ojibway—Sinking is being done at No. 1 shaft at a depth of about 2050 ft., but no laterals have been started below the 17th level. Shaft No. 2 is bottomed at the 1900-ft. level. At No. 2 shaft the only work underway is a crosscut being driven from the 16th level, and which will reach the lode within a few days. At No. 1 shaft the drifts on the 16th and 17th levels are developing good ground.

Iron

Republic Iron & Steel Co.—Diamond drilling is still in progress at the Sherwood property north of Iron River held under option by this company; Cole and McDonald are doing the work.

Chatham—Excavation has been begun for a new change house close to the old building; there will be a main portion 70x34 ft. with two wings one 28x12 ft. and one 26x15 ft., and will have 300 lockers for a proposed force of 150 men, one locker for underground clothes and one for street clothes, for each man. It will be a frame structure with galvanized-iron sheeting. The old change house has accommodations for 60 men. Shipments are being made from the stockpile; 50,000 tons will have been shipped from the pile by the end of the season.

Davidson—At shaft No. 1 a new 400-ft. trestle has been finished. The new change house is nearing completion.

Chicagon Lake—In this district of the Iron River field, an option has been taken on the northwest quarter of Sec. 35, 43-34, by men of Ely, Minn. Hane brothers and Edward Sjoquist own the mineral right. On the northeast quarter of the same section, ore formation was proved several years ago at the Gleason exploration. The nearest operating mine is the Chicagon one mile north.

Caspian—A new, modern office building is being completed at this mine in the Palatka district.

Rogers—At this Rogers-Brown mine in the Iron River district, all the new steel and brick buildings except the change-house are completed and the machinery is being installed.

American—The building for the new concentrating plant is being completed. Operations are being delayed by failure of the machinery to arrive on specified time.

Minnesota

Mesabi Range

Ore is now being shipped from a new state mine in Sec. 17, 58-19, in the Buhl district. The mine is a small one. Drifting from the shaft is in progress under the direction of A. B. Coates.

Ore shipments from Two Harbors continue heavy, the shipments for the year to date being; April, 32,245 tons; May, 1,117,689 tons; June, 1,431,206; July, 1,600,091; August, 1,578,220; a total of 5,759,451 tons. The shipments for the same period during 1911 were 3,687,608 tons, which shows that thus far this season's shipments have been almost double those of last year.

Euclid—The ore remaining in this mine, which was closed down on account of iron-ore prices several months ago, will be cleaned up and shipped.

Scranton—The output from this state mine will be between 250,000 and 300,000 tons for the 1912 season. This is the first year that the mine has been on the list of shippers.

Vermilion Range

Consolidated Vermilion Extension Mining Co.—The mine of this company is now producing a fine quality of iron ore. The shaft is practically free from water, only 250 gal. per min. being required of the pump. The blocking out of ore is progressing rapidly and the company expects that by spring the railway will have finished a 4-mile spur into the property. The plant is well supplied with modern machinery and as the ore is of the same quality as that at Ely, mining will be comparatively easy as compared to the Soudan mine, which is now being operated on a comparatively small scale.

Missouri

Joplin District

Thomas H. Walker has struck rich ore at a depth of 178 ft. on a 40-acre lease in the northern part of Webb City. A mill will be built as soon as a shaft can be sunk.

Granby Mining & Smelting Co.—Cuttings of lead ore are being found at a depth of 137 ft. in the drill holes being put down by this company to the southeast of Duenweg.

Betsey Jane—This mill of 150-tons capacity at Thoms Station will be given a trial run in the near future. Work underground has been suspended pending the erection of a hoister derrick.

Sheridan-Adams Royalty Syndicate—This syndicate has acquired title to a 330-acre tract known as the Snapp land. This land is leased on a royalty basis, the producers being the Cherokee Mining Company, the Little Minister, Foster, and Ortt & Coats. Other leases are being developed and will soon be producing.

Eldorado—This lease southwest of Joplin is being equipped with hand jigs. The jigging is being done by contract for $4 per ton of concentrates.

Montana

Butte District

Alex Scott—During August about 7000 tons of ore was shipped to the East Butte smeltery. The mine has been closed for a short time for the purpose of replacing the cylinders on the hoisting engine, and after this is completed the output will be increased. Development work is being done on the 600-ft. level. Mining in recent months has been confined to the 1600- and 1700-ft. levels, the ore on the 1800-ft. level being held in reserve.

Butte & Superior—Recent changes made in the mill have caused numerous shutdowns, and an intermittent output of concentrates. The working of the mill is fast being perfected however, and it is expected that by the end of September half of the mill will be running smoothly, and within the next few months it will be in condition to treat more than 1000 tons of ore per day. Various experiments toward the further perfection of minor details of the oil-flotation process are still being made, and the Peterson electric smelting process is being used on certain ores. It is not probable that this method will be used to a great extent, at least in the near future, as the present process is proving to be as satisfactory as can be expected. In regard to the Butte-Milwaukee claims, in which the company has a controlling interest and other adjoining property on which it holds options, amounting in all to approximately 300 acres, the intention is to thoroughly develop the entire section.

Butte Northern—Recently, while driving a tunnel along the vein on its property north of the Butte & Bacorn mine, this company cut a vein of commercial ore at a depth of 60 ft. A new compressor and more adequate machinery may be installed for the exploration of this orebody.

Lincoln County

Snowshoe—This property, near Libby, which went into the hands of a receiver some time ago, has been opened again by receiver William Jennison, who has placed Robert C. Davis, of Butte, in charge. A shaft had been sunk to the 500-ft. level and stoping done on the 300-, and 400-ft. levels; also a tunnel had been driven a short distance into the property. Mr. Davis has reopened the stope on the 300- and 400-ft. levels and cut a station on the 500-ft. level, preliminary to development work at that depth. The old concentrator has been repaired, and about 125 tons of ore is now being concentrated daily.

Nevada

Comstock Lode

Mexican—Alterations to the mill have been completed and it is now running full time. Last week, 393 tons of ore was treated of a gross head sample value of $10,000, the apparent extraction being 94%. The ore recovery from the mine for the week was 308 tons of a gross assay value of $8100.

Union Consolidated—A special report on mine conditions was made to the directors of the company last week by the superintendent, Whitman Symmes, in which he advocates the opening, as soon as possible, of two new levels on the 2650- and 2800-ft. levels. It is proposed to sink the joint Sierra Nevada and Union winze, now down to the 2676-ft. level, to the 2800-ft. level, for it is believed that the opportunity is greater to uncover orebodies at greater depth than above the 2500 level. Brief reference is made to the geological features of the Mexican orebody and their relation to the Union Consolidated's possibilities in the way of ore discoveries.

Ward Shaft—A meeting of the United Comstock Pumping Association was held last week, at which time it was voted to proffer the use of the shaft and its present equipment to the Gold Hill mines, the latter to pay the operating costs. The north end and middle group of mines desire to direct their support to the pumping installations and operations now taking place at the C. & C. shaft.

Comstock-Phoenix—Another shipment of high-grade ore stoped from the 400 level was made to a California smeltery last week. This is the second shipment of the month.

Crown Point—Operations have been resumed on the 1400-ft. level and stoping of low-grade ore is underway. An incline winze has been started from the sill floor of No. 1 stope.

Nye County

Shipments in tons from Tonopah mines to date and for the week ended Sept. 7, are as follows:

Mines	Week	Year to Date
Tonopah Mining	2,900	119,719
Tonopah Belmont	3,365	82,307
Montana-Tonopah	1,072	37,164
Tonopah Extension	1,055	35,688
West End	853	26,307
Midway	.....	420
MacNamara	458	12,760
North Star	.....	130
Mispah Extension	.....	40
Jim Butler	300	1,000
Totals	10,003	315,535
Estimated value	$250,075	.....

An important transaction has just been closed by the sale of the Little Tonopah group of 23 patented claims for the sum of $250,000 to John G. Kirchen and Key Pitman, of Tonopah, and Frank A. Keith and Seeley W. Mudd, of Los Angeles. It is understood that the property will be divided and two companies formed to develop the ground on which a shaft has been sunk to a depth of 600 feet.

New Mexico

Socorro County

Socorro Mines—Contract to break ore has been let on a portion of the Consolidated mine, on the Queen vein; the ore will be treated in the Socorro mill. The crusher at the mill is being moved to the shaft and the ore will be transported to bins by belt conveyor, eliminating the elevated tramway. Development faces in the lower levels are being advanced in good ore and a large body has been opened up above 200 level east.

Deadwood Mines—The mill ran continuously in August, treating 1700 tons of ore. A large amount of development was done.

Oaks Co.—During August, 461 tons of ore of an average value of $17 per ton was shipped to the mills from the development of the Pacific and Johnson mines.

Deep Down—Lessees are sinking the shaft in good-grade ore.

Mogollon Gold & Copper Co.—Thirty men are employed at the Little Charlie mine, the ore being sent to the Deadwood custom mill.

Utah

Juab County

Tintic shipments for the week ended Sept. 6 amounted to 227 cars, which is four cars behind the record of 231 made the second week in August.

Victoria Consolidated—This company is considering new power equipment, and it is likely that the machinery will be installed at an early date.

Colorado—Prospecting at depth from the Crown Point has not shown any results, and this company is now looking for the Beck Tunnel orebody within Colorado lines. Shipments of about 80 tons weekly are being made from the stopes between the 200- and 300-ft. levels, and a tunnel is being driven in the northern part of the property to cut the vein near the surface under prominent outcroppings.

Iron Blossom—This company is said to be considering building a concentrating plant to handle low-grade ores. Experiments on the ore have been made.

Piute County

Bully Boy & Webster—The new mill is treating up to 40 tons daily. The amount treated is somewhat restricted at present, owing in part to low water. A good saving is reported on some of the ore, but part of it will require further treatment by cyaniding, and it is stated that a plant for this work will be in operation in the near future.

Salt Lake County

Ohio Copper—It is stated that out of the 1,260,000 shares all but 80,000 have been turned in with the first half of the $1 assessment. The third unit of the mill is now being tried out.

Utah Apex—Two directors of this company, Bradley and Horne, died during this month, and a reorganization of the board is soon to take place.

Summit County

Park City shipments for the week ended Sept. 7 amounted to 3,251,840 lb. During August 7020 tons of ore was shipped, including beside the usual shippers, the Grasselli company, Ontario lease, the McKenzie, Briggs, Anderson, and Lowrie leases, the Little Bell, and Barry-Coxe.

Tooele County

Bullion Coalition Mines—The main drain tunnel is being extended. This level gives about 1800 ft. on the dip of some of the mineral bearing fissures. Oreshoots have been opened for 125 ft. on the strike, and the ore is five or six feet wide in places. The best ore carries from $20 to $25 in lead, silver, and gold. Work is being done on company account on the 600-ft. level, and by several sets of lessees above this ground. Shipments are being made.

Utah County

Among the properties worked throughout the summer in American Fork cañon are the Miller Hill, Blue Rock or Pacific, Mary Ellen, Globe, Dutchman and Yankee. Of these the Dutchman, Miller Hill, and Pacific are making shipments of silver-lead ore. The Pacific is jigging some of its second-class dumps, and is shipping concentrates, beside the regular straight shipping ore.

Union Chief—As soon as this company in the Santaquin district can secure more teams for ore hauling, shipments will be increased.

Washington

Ferry County

Imperator-Quilp—This company recently re-leased the Quilp mine, and has taken over another property in the same vicinity. It is the intention to start operations at once.

International Gold Mining Co.—A contract has been let by this Orient company for sinking a shaft on the Big Bend claim.

International—A shaft is being sunk to the 125-ft. level at this mine, and other improvements are contemplated. Walter Bryant, Orient, has charge of the work.

San Poil—The ore from this property in the Republic district is now being

treated entirely in its own cyanide mill, the first cleanup recently yielding about $5000 in gold and silver.

Michigan Mining & Milling Co.—An electric power plant will be installed at the Gwynn mine of this company, at Orient.

Beecher—This mine, near Orient, which has been closed for several years on account of litigation, will, it is reported, be reopened.

Wisconsin

Plattville District

Wisconsin Zinc Co.—This company has leased the Funk farm of 196 acres just north of the city limits. Some development was done on the property five years ago by the Columbia Lead & Zinc Co.

Sunrise—The lease and mining equipment have been purchased by the Mineral Point Zinc Co. The property is three miles north of Rewey on the Rundell farm and has been a steady producer for the last 10 years.

Scrabble Creek—The top of the main pitch was reached at the depth of 140 ft., carrying a solid sheet of lead and zinc ore 16 in. thick. The property adjoins the Cleveland mine at Hazel Green and is operated by the Vinegar Hill Zinc Co. A 100-ton mill will be built at once.

Wyoming

Albany County

Platinum Mining & Milling Co.—Shipments of high-grade gold-copper-platinum-palladium ore are now being made from the Rambler mine operated by this company. A concentration mill of 50 tons daily capacity is being built to treat the low-grade ore. A new shoot of high-grade ore was recently opened, from which the present shipments are being made.

Commercial Gold Mining Co.—This property, one mile west of Centennial, is being developed by a tunnel which is now 500 ft. long, and from which 200 ft. of crosscut has been driven. This property was formerly known as the Old Centennial. The vein was lost at a fault and the work now being done is to find the faulted portion. The equipment consists of an 8-hp. gasoline engine, pneumelectric drill, dynamo, electric lights, etc. Bernard Holtum is general manager, and while but a few men are now employed, the company expects to increase its working force during this month.

Wyoming Mineral Development Co.—This company, capitalized at $300,000, has a 60-day option on the Victoria and Free Gold groups of claim. Free-milling gold ore is said to outcrop for a long distance over the two groups of claims. W. G. Emerson, formerly of Grand Encampment, is promoting the company.

Canada

British Columbia

Granby Consolidated—During August, 109,105 tons of ore was shipped from the mines in 29 working days, a daily average of 3760 tons. Development work consisted of 632 ft. raising, 378 ft. drifting, 6 ft. sinking, and 1337 ft. of diamond drilling. At the smeltery 2082 tons of foreign and 109,355 tons of company ore was treated.

Ontario

Canadian Talc & Silica Co.—This company, of which H. Hungerford, of Chicago, is president, which owns a talc mine and mill at Eldorado, Ont., has purchased a talc property near Madoc, from J. H. Curley and may erect a mill.

Bewick-Moreing—This syndicate, though it has withdrawn from the Porcupine camp, has no intention of abandoning the Canadian field. It is organizing a system for the investigation of new mining districts with a view to investment and will remove the Canadian office, from Montreal to Toronto.

Ontario-Cabalt

Shipments of ore and concentrates, in tons, from Cobalt for the month of August were, according to Arthur A. Cole, mining engineer for the Timiskaming & Northern Ontario Ry.:

Beaver	63.82
Buffalo	92.10
Casey Cobalt	.....
City of Cobalt	75.49
Cobalt Lake	121.50
Cobalt Townsite	216.65
Chamb.-Ferland	32.00
Coniagas	207.94
Crown Reserve	47.49
Drummond	.....
Hudson Bay	62.80
Kerr Lake	105.78
La Rose	342.37
Lost and Found	.....
McKinley-Darrach	168.52
Nipissing	228.61
O'Brien	.....
Penn.-Canadian	29.69
Provincial	.....
Right of Way	30.61
Timiskaming	62.85
Trethewey	70.35
Wettlaufer	.....
Colonial	21.55
Totals	1980.12

La Rose—An open cut is being made and the noted "silver sidewalk" of the Lawson property is being removed. This vein showing about two feet of high-grade ore has been well stoped out.

Cobalt-Townsite—The royalties payable by this company to the Timiskaming & Northern Ontario Ry. commission have been reduced from 25% of the gross earnings to 15% of the net earnings.

Miller Lake-O'Brien—Good discoveries have recently been made at this mine in the Montreal River district. A winze sunk 45 ft. below the 250-ft. level is in good ore all the way. This level has been opened up for 250 ft. with good ore in both faces, and a cross-vein has been developed for 150 ft. The mine has this year shipped two carloads of high-grade ore, nothing of a lower quality than 4000-oz. ore being sent out.

Ontario—Porcupine

Plenaurum—The crosscut connecting the shafts on opposite sides of Pearl Lake will be finished shortly. When completed, the veins cut under the lake will be opened.

Krist—A promising vein has been uncovered on the surface.

Dane Copper Co.—A shipment of 60 tons of high-grade copper ore has been made to the smeltery at Chrome, N. J.

Mexico

Mexico

El Oro Mining & Railway Co.—During August the mill was in operation 30 days, treating 20,280 tons of ore, and 15,300 tons of tailings, from which $167,320 was recovered as bullion. The working expenses were $94,610 and the expenditures on development $22,650, a total of $117,260. The railway profit was $7830, making the total profit $61,890. The expenditures on permanent mine improvements amounted to $2810.

San Luis Potosi

Tiro General—The standard-gage track of the Central de Potosi R.R. is now in operation between Charcas and the mine, and daily shipments of 300 to 400 tons of ore are being made. S. F. Shaw is superintendent.

Sonora

Four C Co.—A six-compartment shaft has been started at the Capote property. It will be used for the development of a large shoot of ore recently struck. Ore bins are being built to take care of the output of the new shaft.

Calumet & Sonora—The work of raising the main working shaft from the 525 to the 400-ft. level has been completed. The property is shipping an average of 300 tons of zinc and copper concentrate and about 50 tons of lead concentrate per month.

Cananea-Boston—This company has started a new 1½-compartment shaft. It is being sunk at the intersection of the Democratia and Norton veins. The old shaft had to be abandoned on account of the flow of water. It is not expected that such a flow will be encountered in the new shaft.

Democratia—Work has been resumed at this property and it is probable that the old smeltery will be blown in. There is one furnace at the plant with a daily capacity of 125 tons.

Montezuma-Arizpe—This company, operating a mine about 10 miles from Cananea, is now operating its 10-stamp mill and is shipping concentrate to the smeltery.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

Coal Trade Review

New York, Sept. 18—Coal trade in the West is active and strong almost everywhere, with prices firm and advancing. The same condition prevails in the seaboard bituminous trade, which is in better shape than for a long time past, both as to demand and prices.

The West Virginia coal operators have declined the offer of the governor of the state to arbitrate the differences with the miners. The operators are determined to prevent the organization of the state by the United Mine Workers, if possible.

The shadow on the coal market is the probable shortage of cars. Complaints are already being made of car scarcity and slow movement of coal.

Anthracite trade continues very active and the companies are rushing work at the collieries to keep up with their orders.

Coal passing through Sault Ste. Marie Canals season to Sept. 1, short tons:

	1911	1912	Changes
Anthracite.....	1,226,515	926,926	D. 299,589
Bituminous.....	8,116,034	8,063,094	D. 52,940
Total.....	9,342,549	8,990,020	D. 352,529

The anthracite trade has not yet caught up with that of last year. The bituminous shipments are also a little below.

Austrian Coal—Coal production of Austria, half-year ended June 30, metric tons:

	1911	1912	Changes
Coal	7,217,717	7,718,574	I. 500,857
Brown coal	12,593,732	12,747,064	I. 153,332
Total mined ..	19,811,449	20,465,638	I. 654,189
Coke made.....	1,026,232	1,115,561	I. 89,329
Briquettes made.	173,395	199,181	I. 25,786

Of the briquettes reported this year, 116,138 tons were made from brown coal or lignite.

Iron Trade Review

New York, Sept. 18—The iron and steel markets are this week practically a repetition of several weeks past. Specifications on contracts continue heavy enough to keep all the mills busy, and new orders are not lacking. Advances in prices seem to be suspended for the time being, except in pig iron.

The finished-steel market has not shown the increase in activity which usually comes with September. Conditions are, if anything, quieter than in July and August, but the showing is not entirely unfavorable, for those months were abnormally active. There is reason to conclude, however, that the steel industry is not necessarily marked for an unending increase in prices and activity. While the pressure for early deliveries is greater, if anything, the tendency to buy for farther forward delivery does not increase. There is really very little buying for the new year. Formal announcement was made during the past week by the Republic Iron & Steel Co. that its price on merchant steel bars for first quarter is 1.35c., its price having been 1.30c. for this year; and it is understood that other mills, while they have not made formal announcements, have assumed the same attitude. There is, however, very little buying for that delivery.

The pig-iron market has been strong, with a general disposition among furnaces to advance prices on all new business. Foundry iron has been in demand; basic is also taken, with many new inquiries; while quite a business in bessemer iron has gone to the furnaces. Advances of 25 or 50c. per ton have been frequent. Southern iron has had the call on foundry business.

Mills using billets and blooms are finding trouble in getting their crude steel. Production is not up to the requirements, and mills are behind in deliveries to a serious extent.

Alabama Iron Rates—The Interstate Commerce Commission will about Oct. 28 hear the complaint of Southern iron manufacturers, who ask a lower freight rate on iron and kindred products to the Ohio gateway points. The matter was to have been taken up this week but William Wimbish, attorney for the iron manufacturers, is ill and for this and other reasons a postponement was taken. Consumers and others in the Middle West join with the Southern iron manufacturers in making the complaint and are pushing the matter. With a reduction in freight rates to the Ohio river gateways, it is claimed the manufacturers in the South would be able to dispose of large quantities of iron, the competition of Northern and Western manufacturers notwithstanding. Five of the pig-iron manufacturers of the Central West and North put in an intervention in the case and will assist the railroads in opposing the request of the Southern furnaces. The intervention puts forth the claim that the Southern furnace companies have their ores, limestone and coke right at hand, while the furnace companies complaining have to haul their ores long distances, their cost of production being greater than that of the Southern furnaces.

Baltimore

Sept. 16—Exports for the week included 637,800 lb. iron pipe to Antwerp; 100,300 lb. galvanized pipe and 35,068 lb. galvanized sheets to Hamburg. Imports included 711 tons ferromanganese from Liverpool; 250 tons manganese ore from Rotterdam; 5550 tons manganese ore from Poti, Russia; 3436 tons pyrites from Huelva, Spain; 11,450 tons iron ore from Cuba.

Birmingham

Sept. 16—Selling freely and on an advancing market, the Southern pig-iron manufacturers acknowledge a strong market. There is need for all the iron that can be produced and the output will be increased just as soon as furnaces can be gotten into shape. Many sales of iron have been made on a basis of $13 per ton, No. 2 foundry, while some business has been transacted at $13.50 per ton, No. 2 foundry. It is believed that before the end of the month $14 will be reached. By the end of the year the prediction is made that $15 will be the price. Some of the companies in this section, including the largest, are behind in deliveries and consumers have been asking other iron manufacturers to help out. Some foreign business has again attracted attention and an estimate is made that in the last few weeks no less than 15,000 tons of iron were sold for export by Southern manufacturers, most of it to go to Italy. Inquiries are in hand for iron to be delivered on during the first half of next year. Coal cars are being used for deliveries of pig iron. The Sloss-Sheffield Steel & Iron Co. will have its furnace near Sheffield ready by the end of the month and within two weeks from that date the North Birmingham furnace, now under repairs, will be in readiness for operation. The Tennessee Co. by the end of the year will have another furnace at Ensley ready for operation.

The demand for steel products is also strong and there is a steady operation of the Tennessee Co. plants at Ensley and Bessemer and the Southern Iron & Steel Co.'s plant at Gadsden.

The Bessemer rolling mill is busy on steel shapes and angles.

Charcoal iron is in fairly good demand, while scrap is also needed. The foundries and machine shops, with labor troubles still on, are doing as nicely as could be expected.

Chicago

Sept. 17—Pig iron has been active in the last week and bids fair to continue in large demand for at least another seven days. Some of the larger users have been buying for first quarter and first half, in lots ranging up to 5000 tons each. The aggregate for the week is between 40,000 and 50,000 tons, a large record for this market.

Prices have advanced, No. 2 foundry now being held at $16.50@17 for Northern, at furnace, which means $17@17.50 delivered, and $13, Birmingham, or $17.35, Chicago, for Southern. The latter price is the minimum; some interests ask $13.50 on next year's deliveries and one is holding out for $14, Birmingham. Charcoal iron has also advanced, now selling at $17.75, Chicago.

The buying seems to be due to the general belief of melters that the upward tendency in the market is a lasting one, and that they can no longer rely on their policy of buying often in small lots. It fulfills the expectations of the furnace agents who for many weeks have been refusing to sell pig iron for 1913 delivery in any quantity, except at higher prices than have obtained for last-quarter deliveries. There is still some business done in last-quarter supplies, but this consists mostly of small lots, and prices on such lots run 25 or 50c. lower than for the first quarter or first half.

In nearly all lines, finished material continues to be in greater demand than supply, despite advancing prices. Railroad supplies and structural material are sought beyond the capacity of the mills for early delivery and the producers are yet reluctant to bind themselves for 1913 deliveries. Bars are in very large demand, both iron and steel; plates and sheets are strong.

Cleveland

Sept. 16—Some delay in ore shipments was caused last week by a strike of the laborers on the Allouez docks. This will reduce September shipments.

Pig Iron—Demand is good and prices are firm. The number of furnaces in a position to blow in is limited by the supplies of ore and coke. Quotations, Cleveland delivery, are $15.65@15.80 for bessemer; $15 for No. 2 foundry.

Finished Material—Demand continues active in nearly all lines. Mills are still hanging back on 1913 contracts. Bars have, however, been sold for first-quarter delivery. For most material for next year higher prices are asked than buyers want to pay.

Philadelphia

Sept. 18—The demand for pig iron has declined materially and inquiries for first-quarter delivery are not resulting in orders, owing to the strong prices asked and the indifference of makers as to business. A good deal of correspondence is in progress between prospective buyers and makers, relative to future dealings, but very little actual business can be reported during the week. Iron is held higher than a week ago and basic especially, is quoted at figures which are discouraging to business. Fortunately, most of the larger consumers are fairly well supplied by contract and can afford to remain out of the market for some little time. A number of foundry interests in the East would place orders at once if prices suited, but they are in a position to delay contracting for at least a month. The cast-iron pipe makers are out of the market, having work ahead pretty well covered by pig-iron contracts, most of them being placed with Southern iron makers. No. 2 X foundry is quoted at $16.75 as an outside figure; forge $16; basic $16.50, and low phosphorus $21.50 per ton.

Steel Billets—Openhearth billets are quoted at $25.90, forging billets $30 as a bottom price, with transactions for early delivery $2 higher.

Bars—Bar iron has slightly advanced and 1.45@1.47½c. is a bottom price with an upward tendency for early delivery. The mills are crowded to the limit for the present.

Sheets—Sheets have advanced in selling prices within a week and premium quotations are the rule.

Pipes and Tubes—The only business done this week has been for what is regarded as early delivery and at premium quotations in tubes. Merchant pipe is also strong and active.

Plates—Orders for steel plate have been unusually large, though most of the business has been in small lots ranging in delivery from one month from date to as late as next April. Inquiries for small lots are steadily increasing.

Structural Material—The week's business has fallen much below the average. The tone of the market is strong and premium prices are the rule with nominal quotations at 1.60c. Eastern makers are unable to accommodate Western buyers who have overtaxed Western mills.

Scrap—The scrap market has been quiet, owing to the diminution of stocks and the difficulty dealers are experiencing in obtaining material on standing orders.

Pittsburgh

Sept. 17—The local iron and steel market shows no material change from last week. Pig iron continues its progress toward higher prices, with moderate buying. Finished-steel prices show a stiffening here and there, but in general are unchanged. The rearrangement made by the National Tube Co. under date of Sept. 10 in merchant steel pipe and boiler tubes has been adopted by the independent producers. The mills are operating at slightly better advantage than in August, the weather being favorable, and all the available capacity being employed. Full production of steel for the balance of the year is practically assured.

Pig Iron—On light sales bessemer pig-iron has advanced 50c. to $15.50, Valley. Today two or three lots were sold at this figure, aggregating 500 tons or more, while firm bids for large tonnages at $15 have been promptly refused. Basic iron has not moved correspondingly. While the furnaces are quoting $14.50@14.75, Valley, there are no authenticated cases of regular sales at above $14. Sales aggregating 10,000 tons were made by one interest at the reported price of $14.50, furnace, but the furnace is outside the Valleys, and has a freight advantage of 50c. to certain consuming points. A sale of 3000 tons was made at $14.35, Valley, but this was for next year's delivery. It is reported that the Pittsburgh Steel Co. has bought about 40,000 tons of basic iron to be made at Josephine furnace and shipped over the balance of this year, at about $14, furnace, or a trifle less. Inquiry for foundry iron for next year has increased. On all grades the furnaces are asking somewhat more for next year's delivery than for the balance of this year. There are six idle merchant furnaces in the two valleys, and they are all watching the market closely, with the idea of getting into blast if slightly higher prices can be secured, and if they could sell freely at 25 or 50 cents above present market prices it is probable that most of these furnaces would immediately prepare to get into operation. We quote for this year's delivery: Bessemer, $15.50; basic, $14@14.50; malleable, $14.25@14.50; No. 2 foundry, $14.25@14.50; gray forge, $13.75@14, all f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The ferromanganese market has been fairly firm since the $3 advance of Sept. 9 to $56.50, Baltimore, but occasionally this price could be shaded a trifle on a small prompt lot. Consumers are believed to be fairly well covered for the next few months. We quote the market at $56.50 for contract and at $56@60 for prompt, f.o.b. Baltimore, freight to Pittsburgh being $1.95.

Steel—The scarcity of unfinished steel is still more pronounced, and fancy prices are frequently paid for early deliveries, although, of course, these do not exactly represent the market. The highest price paid on any sizable lot of unfinished steel is represented in the transaction of 1000 tons of small billets, which went at $27, delivered to consumer's mill, Pittsburgh district. The general position of the market is represented by prices quoted a week ago, though frequently higher prices must be paid to get material for early delivery: Bessemer billets, $23@23.50; bessemer sheet bars, $23.50@24;

openhearth billets, $24@24.50; openhearth sheet bars, $24.50@25; rods $25.50@26, f.o.b. maker's mill, Pittsburgh or Youngstown.

Sheets—The market is strong at last week's advance, which amounted to $2 a ton in black sheets and $3 a ton in galvanized. The advance, as noted in last report, was started by the independent mills, but it is now understood that the leading interest is adhering to the advanced figures also. The mills are sold up practically for the balance of this year, on contract, and most of them have specifications on books for from five to ten weeks' of full operation. Blue annealed sheets are scarce and while no general advance has occurred some mills are quoting a $2 advance as their minimum. We quote: Black sheets, 28 gage, 2.15c.; galvanized, 28 gage, 3.30c.; blue annealed, 10 gage, 1.50@1.60c.; painted corrugated, 28 gage, 2.30@2.35c.; galvanized corrugated, 3.35c. for 28 gage.

St. Louis

Sept. 16—Prices on pig iron have stiffened up considerably during the week. Buying has been quite active. Southern No. 2 foundry at $12.50, Birmingham, is hard to locate—most of the producers are holding out for $13, Birmingham, or $16.75, St. Louis, and are asking a premium of 50c. per ton over these prices for second-quarter delivery. Northern iron is quiet, though prices have advanced, No. 2 being quoted at around $16.50, St. Louis.

Foundry coke is bringing about $5.40, St. Louis.

Iron Ore Trade

A block of Cuban ore, 35,000 tons from El Cuero mine in the Daiquiri district, is reported sold to an Eastern iron company for 1913 delivery.

Sault Ste. Marie Canal Traffic

Freight passing through the Sault Ste. Marie Canals in July was 10,781,304 short tons, being 34,145 tons more than in June. For the season up to Aug. 1 the total freight was, in short tons:

	1911	1912	Changes
East-bound	15,299,750	23,266,029	I. 7,966,273
West-bound	7,639,761	7,366,045	D. 273,716
Total	22,939,511	30,632,074	I. 7,692,569

The number of vessel passages this year was 10,020, showing an average cargo of 3057 tons. The mineral freights included in the totals were, in short tons except salt, which is given in barrels:

	1911	1912	Changes
Coal	6,838,023	6,486,454	D. 351,569
Iron ore	13,412,646	20,248,973	I. 6,836,327
Pig and mfd. iron	196,615	296,648	I. 100,033
Copper	55,860	46,938	D. 8,922
Building stone	3,142	2,282	D. 860
Salt, bbl	303,043	362,286	I. 59,243

Iron ore was 66% of the total freight, and coal 21.1% this year.

METAL MARKETS

New York, Sept. 18—The metal markets have been fairly active and strong. Speculation in tin is again active in London.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
July 1912	$ 7,263,624	$ 3,747,869	Exp. $3,515,755
" 1911	2,178,088	2,594,653	Imp. 416,565
Year 1912	40,660,460	29,012,211	Exp. 11,648,249
" 1911	15,429,650	36,367,679	Imp. 20,938,029
Silver			
July 1912	6,591,054	3,449,716	Exp. 3,141,338
" 1911	5,275,008	3,920,794	Exp. 1,354,214
Year 1912	40,260,276	28,713,965	Exp. 11,546,311
" 1911	39,718,211	25,881,395	Exp. 13,836,816

Exports from the port of New York, week ended Sept. 14: Gold, $120,000; silver, $1,152,358, chiefly to London. Imports: Gold, $460,015; silver, $70,833, from the West Indies, Mexico and South America.

Gold—The price of gold on the open market in London remains at the Bank level, 77s. 9d. per oz. for bars, and 76s. 4d. per oz. for American coin. There was some gold taken for Turkey, some for Germany, and on Sept. 16 there was £750,000 taken for shipment to New York. More is expected to follow.

Iridium—Current price of iridium is $63@64 per oz., New York.

Platinum—Notwithstanding reports of an uncertain position, quotations hold steady, both here and abroad, and no change is reported. Dealers here ask $45.50 per oz. for refined platinum and $48 per oz. for hard metal.

Silver—The price of silver has been well maintained. The impression prevails, that the India government will need more silver before it is through the present purchase movement.

SILVER AND STERLING EXCHANGE

September	12	13	14	16	17	18
New York	62⅜	62⅛	63	63	63¼	63¼
London	28 11/16	28⅞	29 1/16	29 1/16	29 1/16	29 1/16
Sterling Ex.	4.8570	4.8545	4.8565	4.8570	4.8575	4.8575

New York quotations, cents per ounce troy, fine silver: London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Sept. 5, as reported by Messrs. Pixley & Abell:

	1911	1912	Changes
India	£5,404,000	£6,418,700	I. £1,014,700
China	949,700	933,500	D. 16,200
Total	£6,353,700	£7,352,200	I. £998,500

Messrs. Samuel Montagu & Co. write from London, Sept. 5: "The Indian currency returns received on Sept. 3, reports a rise in the total of silver coin of 47 lakhs, and a fall in the total of gold of 10 lakhs. It is stated that the reserve holds 2 crores of silver in transit. The amount of silver required at the present price to provide a crore of rupees is about £450,000. The amount of silver bullion under coinage is described as 37½ lakhs compared with 7½ lakhs last week.

Copper, Tin, Lead and Zinc

NEW YORK

September	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Tin: Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
12	17⅝ @17¾	17 50 17.55	48¼	5.10	4.95 @5.00	7.40 @7.50	7.25 @7 35
13	17⅝ @17¾	17.45 17.50	49¼	5.10	4.95 @5.00	7.45 @7.50	7.30 @7.35
14	17⅝ @17¾	17.45 17.50	49⅜	5.10	4.95 @5.00	7 45 @7.50	7 30 @7 35
16	17⅝ @17¾	17.45 17.50	49⅝	5.10	4.95 @5.00	7.45 @7.55	7.30 @7.40
17	17⅝ @17¾	17.45 17.50	48⅛	5.10	4.95 @5.00	7.45 @7.55	7.35 @7.40
18	17⅝ @17¾	17.45 17.50	48¾	5.10	4.95 @5.00	7.45 @7.55	7.35 @7.45

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Sept.	Copper: Spot	Copper: 3 Mos	Copper: Best Sel'd	Tin: Spot	Tin: 3 Mos	Lead, Spanish	Zinc, Ordinaries
12	78	79⅛	83⅛	223¼	220¼	22¼	27
13	78 5/16	79 5/16	83⅛	224¼	222	22⅛	27
14	....	....	....	.....	.....	....	....
16	78 7/16	79¼	83⅛	226½	223½	22¾	27
17	78¼	79⅜	83⅛	222	218¾	22¾	27
18	78 5/16	78¾	83⅛	224¼	221	22½	27¼

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 21¾c.

Copper—The market has been relatively inactive, there being but little demand either from domestic consumers or from foreign. The abstention of the European buyers is creating some nervousness, it being feared that they overbought a little while ago to a greater extent

than was estimated; also that possibly the European consumption may be falling off. However, sellers here have not yet shown any anxiety to dispose of their supplies, although several have a good deal of copper both for near-by and later deliveries that they would like to sell. Their attitude for the moment is to hold aloof and await developments. Several lots of electrolytic copper were sold during the week at 17.45c., cash, New York. If the pegged price of 17¾c., delivered, usual terms, is realized, it is for deliveries to Western points figured up to New York basis or for deliveries to points to which the freight is higher than the average. Business in Lake copper has been slack and the market for this kind is largely nominal. At the close Lake copper is quoted 17⅝@17¾c.; electrolytic in cakes, wirebars or ingots 17.45@17.50c., while casting copper is quoted nominally at 17.30@17.40c. as an average for the week.

The average price of electrolytic copper for the first half of September was 17.527 cents.

The London market has fluctuated within narrow limits, spot holding around £78 5s., and three months around £79 2s. 6d. At the close spot is quoted £78 6s. 3d., three months £78 7s. 6d. per ton.

Coppers sheets are 23@24c. per lb., base for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 19@19¼c. base, carload lots at mill.

Copper exports from New York for the week were 6353 long tons. Our special correspondent gives the exports from Baltimore at 1407 tons for the week.

Constant increase in ocean-freight rates affects materially the net return on sales of copper to Europe.

According to telegraphic dispatches today, the miners of Bingham Cañon, Utah, upward of 4000 in number, have voted to strike for an increase in pay, especially to abolish, or reduce, the differential between the wages paid to men engaged in open work and those engaged in underground work.

Visible stocks of copper in Europe, Sept. 15, are reported as follows: Great Britain, 29,890; France, 8330; Rotterdam, 500; Hamburg, 3600; afloat from Chile, 2050; afloat from Australia, 5100; total, 49,470 long tons, or 110,812,800 lb. This is a decrease of 865 tons from the Aug. 31 report.

Tin—Early in our week, the market continued to display great strength and advanced from day to day, reaching almost 50c. on Sept. 16. The following day the London market declined about £4 10s., which was the first pronounced reaction after a continuous rise of almost £30 in about eight weeks, and the price here reacted to 48½ cents.

The statistical position of the article is a very strong one indeed, and it is believed that the market is likely to hold, if not go higher. At the close tin is quoted 48¾c. for September delivery.

The London market, on Sept. 12, closed at £223 5s. for spot and £220 5s. for three months. On Sept. 13 it advanced to £224 10s. and £222, for spot and three months, respectively. On Sept. 16 it went still higher, to £226 10s. for spot and £223 10s. for three months. During that day spot actually touched £227 10s., an unprecedentedly high figure. On Sept. 17, spot re-acted to £222, and three months to £218 15s., closing on Sept. 18 at £224 5s. for spot and £221 for three months.

Lead—The market is firm and a good business is doing at 5.10c., New York, and about 4.95@5c., St. Louis. Consumption is excellent, stocks are small and the article is in a very strong position.

The foreign market remains very firm and lead for near-by shipment is scarce. At the close Spanish lead is quoted £22 10s. and English lead 2s. 6d. higher.

Spelter—Consumption continues excellent, and there has been a fair business at advancing prices. However, the market has now reached a point at which foreign spelter can be imported at a profit. Importations have already taken place and further quantities are reported to be on the way. This has had the effect of bringing the Eastern market below the parity of St. Louis, and at the close St. Louis is quoted 7.35@7.45c.; New York, 7.45@7.55 cents.

The foreign market is very firm at £27 for good ordinaries and £27 5s. for specials.

Base price of zinc sheets was advanced 15c. on Sept. 12, and is now $8.90 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Zinc dust is quoted at 7⅜@7½c. per lb., New York.

Other Metals

Aluminum—Business is good and the market is firm. Quotations are 24¾@25c. for No. 1 ingots, New York.

Antimony—The market is again strong and active, and a good business has been done. Prices have advanced all around. Cookson's is quoted at 8¾c. per lb., and Hallett's at 8¼@8½c.; while 8⅛@8⅜c. is asked for Chinese, Hungarian and other outside brands.

Quicksilver—The market is steady, and prices here are unchanged. New York quotations are $42 per flask of 75 lb., with 60c. per lb. for retail lots. San Francisco, $41.50 for domestic orders and $39 for export. The London price is £8 per flask, with £7 17s. 6d. quoted from second hands.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Nickel—Shot, blocks, plaquettes bring 40@45c. per lb., according to quality. Electrolytic nickel is 3c. per lb. higher.

The International Nickel Co. has organized by the election of the same officers and directors who served on the old International Nickel Co., with the exception of William A. Bostwick, who was elected second vice-president in place of Capt. J. R. Delamar, resigned.

German Metal Trade

Imports and exports of metals other than iron and steel in the German Empire, six months ended June 30, were, in metric tons:

	Imports	Exports	Excess	
Copper	118,618	45,088	Imp.	73,530
Copper, 1911	98,826	40,546	Imp.	58,280
Tin	8,169	4,721	Imp.	3,448
Tin, 1911	6,779	5,033	Imp.	1,746
Lead	40,136	24,606	Imp.	15,530
Lead, 1911	43,287	21,556	Imp.	21,731
Zinc	24,261	57,472	Exp.	33,211
Zinc, 1911	25,580	63,584	Exp.	38,004
Nickel	911	1,328	Exp.	417
Nickel, 1911	1,673	1,083	Imp.	590
Aluminum	7,503	2,431	Imp.	5,072
Aluminum, '11.	4,396	1,470	Imp.	2,926
Minor metals	827	8,399	Exp.	7,572
Minor, 1911	886	6,708	Exp.	5,822

The figures include alloys and manufactures of the different metals. The imports and exports of ores for the three months were, in metric tons:

Ores:	Imports	Exports	Excess	
Gold ore	117	1	Imp.	116
Gold ore, 1911	104	1	Imp.	103
Silver ore	801	.....	Imp.	801
Silver ore, '11.	1,466	.....	Imp.	1,466
Copper ore	12,669	10,935	Imp.	1,734
Copper ore, '11.	9,805	11,118	Imp.	1,313
Tin ore	7,650	.....	Imp.	7,650
Tin ore, 1911	8,608	.....	Imp.	8,608
Lead ore	68,421	1,797	Imp.	66,624
Lead ore, 1911.	58,427	1,851	Imp.	56,576
Zinc ore	122,459	19,206	Imp.	103,253
Zinc ore, 1911.	121,076	26,252	Imp.	94,824
Nickel ore	10,249	.....	Imp.	10,249
Nickel ore, '11.	6,502	.....	Imp.	6,502
Miscellaneous	14,413	3,091	Imp.	11,322
Miscellan's, '11	3,740	489	Imp.	3,251
Chrome ore	10,838	328	Imp.	10,510
Chrome ore, '11	4,301	546	Imp.	3,755
Pyrites	465,694	23,182	Imp.	442,512
Pyrites, 1911	376,655	4,243	Imp.	372,412

Miscellaneous includes ores of tungsten, molybdenum and other rare metals.

Zinc and Lead Ore Markets

Platteville, Wis., Sept. 14—The base price paid this week for 60% zinc ore ranged from $56 to $60. The base price paid for 80% lead ore was $63 per ton.

SHIPMENTS, WEEK ENDED SEPT. 14

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Benton	1,217,810	.....	716,200
Mineral Point	655,400	.....	.....
Platteville	563,400	54,440	66,000
Shullsburg	404,000	.....	.....
Highland	349.900	.....	.....
Hazel Green	250,000	.....	.....
Harker	179,430	.....	.....
Galena	151,200	.....	.....
Cuba City	69,520	.....	.....
Total	3,840,720	54,440	782.200
Year to date	144.920,870	5,991,860	24.889,730

Shipped during week to separating plants, 1,852,590 lb. zinc ore.

Joplin, Mo., Sept. 14—For this week's delivery the change in price is small from last week's settlement prices, but week-end offerings for next week's delivery

advanced to $65, on a base per ton of 60% zinc ranging from $58 to $62. Zinc silicate sold at $30@31 per ton of 40% zinc. The average price, all grades of zinc, is $56.12. Lead sold up to $62, on a base of $60 per ton of 80% metal content. All prices are now based upon the metal content, dry weight, basis 80% metal, succeeding the old method of buying on a flat rate and docking for moisture and impurities. The average price, all grades of lead, is $59.14 per ton.

SHIPMENTS, WEEK ENDED SEPT. 14

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	5,448,450	.....	1,288,190	$193,925
Joplin	2,889,400	.....	311,530	93,085
Duenweg	972,450	.....	96,760	30,616
Alba-Neck	977,290	.....	35,400	30,380
Oronogo	608,620	.....	346,550	24,780
Miami	283,400	.....	155,790	12,320
Galena	297,700	.....	54,100	10,250
Cave Springs	307,440	.....	.....	8,915
Jackson	83,430	.....	180,450	7,745
Spurgeon	8,470	210,580	116,180	7,295
Carl Junction	190,440	.....	18,480	6,450
Carthage	130,000	36,480	.....	4,446
Wentworth	131,020	46,970	.....	4,371
Granby	.....	199,320	27,260	4,300
Sarcoxie	85,000	.....	.....	2,380
Aurora	.....	124,290	.....	2,235
Totals	12,413,110	617,540	2,630,690	$443,493
37 weeks	388,146,940	23,702,110	66,603,090	$12,402,128

Blende val., the week, $354,916; 37 weeks, $10,178,685
Calamine, the week, 10,764; 37 weeks, 363,416
Lead value, the week, 77,813; 37 weeks, 1,860,427

MONTHLY AVERAGE PRICES

Month	Zinc Ore				Lead Ore	
	Base Price		All Ores		All Ores	
	1911	1912	1911	1912	1911	1912
January	$41.85	$44.90	$40.55	$43.54	$55.68	$58.92
February	40.21	45.75	39.16	43.31	54.46	52.39
March	39.86	51.56	38.45	49.25	54.57	54.64
April	38.88	52.00	37.47	50.36	56.37	54.18
May	38.25	55.30	36.79	53.27	55.21	52.45
June	40.50	55.88	38.18	54.38	56.49	55.01
July	40.75	58.85	38.36	56.59	58.81	58.83
August	42.50	55.13	41.28	53.27	60.74	57.04
September	42.63	.....	41.29	.....	59.33	.....
October	42.38	.....	40.89	.....	54.72	.....
November	45.40	.....	43.27	.....	57.19	.....
December	44.13	.....	40.76	.....	62.03	.....
Year	$41.45	.....	$39.90	.....	$56.76	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore: the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, Sept. 18—The general market is in good condition and fairly active.

Arsenic—The market is strong and rather excited. Spot supplies are very scarce and nothing can be had under $4.75@5 per 100 lb. German producers have cabled an asking price of $6 per 100 lb. A large American producer claims that the ores now treated are lower in arsenic than formerly, and that for some time past the main production has been from accumulated stocks of flue dust, which are now nearly exhausted.

Copper Sulphate—Business is fair. Prices are unchanged at $5.50 per 100 lb. for carload lots, and $5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Business is good and prices remain firm. Quotations are 2.52½c. per lb. for spot and September nitrate; 2.57½c. per lb. for October-January deliveries.

Phosphate Rock—The Interstate Commerce Commission, on Sept. 10, suspended until Jan. 11, proposed increases in the rates on phosphate rock in bags or barrels from Franklin and other producing points in Tennessee, to Baltimore, Philadelphia, New York and Boston. The increases average over $1 a ton.

Mining Stocks

New York, Sept. 18—On Sept. 12 there was a little more activity on the Exchange, though speculation is still limited by high rates for money. The Curb was dull and irregular, with only small trading in mining stocks.

Sept. 13 business on the Exchange was light and irregular, but prices were firmer at the close. On the Curb there was some dealing in coppers, but few price changes. Other mining stocks were dull.

Sept. 15 the Exchange was dull. On the Curb also there was little interest and light trading. The high rates for money still depress speculation.

Sept. 16 prices on the Exchange were firmer, on light business. The Curb was more active. Coppers were easier on fair trading, and other mining stocks generally firm.

Sept. 17 and 18 the Exchange was rather broader and more active, but irregular. Copper stocks were more active and were firm on the Curb, while other mining stocks showed increased sales and slightly better prices.

Boston, Sept. 17—Wolverine, by all odds, has been the feature of the local market the past week. It made a low price at $75.25, from which it has recovered to $81.50. This, notwithstanding the fact that the regular semi-annual dividend of $5 was declared about a week ago. Rumors of worked-out ground have been responsible for a good part of the selling. A report that Wolverine, Mayflower and Old Colony would be consolidated received no credence.

The mining-share market, after a period of dullness and weakness, again shows signs of regaining life, particularly the Cole-Ryan stocks. Calumet & Arizona has recovered $1.25 from the recent low to $80.50, and North Butte is up over $1 to $34.75. Hancock came in strong today with a $2 advance to $26.50, which is $2.75 from the recent low. Sales of Ahmeek are recorded at $350. The directors have declared a quarterly dividend of $6, payable Oct. 10. This company started with a $2 payment last fall and has increased its rate $1 each successive quarter.

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	June	July	August
Alaska shipments	4,134,569	2,224,441	1,242,836
Anaconda	22,750,000	23,000,000	25,250,000
Arizona, Ltd	3,300,000	3,200,000	3,260,000
Copper Queen	7,622,730	7,708,147	8,040,424
Calumet & Ariz	4,160 000	4,748,000	4,514,000
Chino	1,474,979	2,945,000	3,437,309
Detroit	1,959,634	2,194,090	1,882,289
East Butte	.....	.....	1,410,500
Mammoth	.....	.....	.....
Mason Valley	1,438,580	1,500,000	.....
Nevada Con	5,913,832	6,084,274	.....
Ohio	665,000	617,500	.....
Old Dominion	2,130,000	.....	2,620,000
Ray	3,004,195	2,985,965	2,888,095
Shannon	1,270,000	1,446,000	1,400,000
South Utah	162,335	142,555	224,855
United Verde*	2,500,000	2,500,000	2,500,000
Utah Copper Co	8,772,742	10,602,000	11,248,992
Lake Superior*	15,600,000	19,500,000	21,000,000
Non-rep. mines*	8,300,000	8,970,000	8,970,000
Total production	.....	.....	.....
Imports, bars, etc.	24,262,292	.....	.....
Total blister	.....	.....	.....
Imp. in ore & matte	8,404,936	.....	.....
Total American	.....	.....	.....
Miami†	2,683,310	3,027,710	3,048,750
Brit. Col. Cos.:			
British Col. Copper	996,000	1,026,006	.....
Granby	1,888,400	1,802,753	.....
Mexican Cos.:			
Boleo†	1,851 920	2,386,480	.....
Cananea	4,310,000	4,000,000	4,044,000
Moctezuma	3,176,819	3,094,016	3,229,839
Other Foreign:			
Cape Cop., S. Africa	.....	.....	.....
Kyshtim, Russia	.....	1,325,000	.....
Spassky, Russia	757,120	795,200	.....
Famatina, Argen	.....	.....	.....
Tilt Cove, Newf'd	.....	.....	.....
Exports from:			
Chile	9,856,000	8,960,000	8,512,000
Australia	8,176,000	8,288,000	8,064,000
Arrivals in Europe‡	12,667,200	14,114,240	20,200,320

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER.

Month	U.S. Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
VIII, 1911	125,493,667	59,935,364	69,855,660
IX	115,588,950	57,311,584	50,824,011
X	118,255,442	64,068,307	60,084,349
XI	111,876,601	68,039,776	67,049,279
XII	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912	119,337,753	62,343,901	80,167,904
II	116,035,809	56,228,368	63,148,096
III	125,694,601	67,487,466	58,779,566
IV	125,464,644	69,513,846	53,252,326
V	126,737,836	72,702,277	69,485,945
VI	122,315,240	66,146,229	61,449,650
VII	137,161,129	71,094,381	60,121,331
VIII	145,628,521	78,722,418	70,485,150

	Visible Stocks		
	United States	Europe	Total
IX, 1911	133,441,501	191,228,800	324,670,301
X	140,894,856	191,945,600	332,840,456
XI	134,997,642	176,825,600	311,823,242
XII	117,785,188	164,281,600	276,066,788
I, 1912	89,454,695	158,323,200	247,777,895
II	66,280,643	154,851,200	221,131,843
III	62,939,988	141,142,400	204,082,387
IV	62,367,587	136,819,200	199,186,787
V	65,066,029	134,176,000	199,242,029
VI	49,615,643	117,801,600	167,417,243
VII	44,335,004	108,186,000	152,521,004
VIII	50,280,421	113,299,200	163,579,621
IX	46,701,374	113,568,000	160,269,374

Trading on the Curb has been of generous proportions. Alaska Gold has been the feature, although the price has settled to $8.62½. Smokey Development has come in for attention, advancing from under $2 to $3.50 per share.

Assessments

Company	Delinq	Sale	Amt
Andes, Nev.	Sept. 26	Oct. 17	$0.05
Black Bear, Ida.	Sept. 26	Oct. 26	0.01
Cedar Talisman, Utah	Sept. 14	Oct. 3	0.00½
Columbus Extension, Utah.	Sept. 30	Oct. 23	0.02½
Dalmatia Ida	Aug. 24	Sept. 21	0.002
Eagle Mt., Ida.	Sept. 23	Oct. 23	0.00½
Empire, Ida.	Sept. 23	Oct. 23	0.002
Great Eastern, Ida.	Sept. 28	Oct. 28	0.002½
Hale & Norcross, Nev.	Oct. 3	Oct. 24	0.05
Hilarity, Ida.	Sept 5	Oct. 5	0.002
Little Butte, Ida.	Sept. 21	Oct. 21	0.001
Mineral Hill, Nev.	Aug. 5	Oct. 5	0.01
New Hope, Ida	Sept. 3	Oct. 3	0.002
Ohio Copper, Utah.	Aug. 28	.....	0.50
Reindeer, Ida.	Sept. 7	Oct. 5	0.003
Savage, Nev.	Oct. 2	Oct. 24	0.10
Seg. Belcher, Nev..	Oct. 4	Oct. 25	0.02
Sierra-Nevada, Nev.	Sept. 25	Oct. 16	0.05
Snowshoe, Ida.	Sept. 30	Oct. 30	0.005
Temple, Ida	Sept. 30	Oct. 30	0.002
Twin Star, Ida.	Aug. 31	Sept. 28	0.02
Wasatch, Utah.	Sept. 27	Oct. 16	0.01

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52.375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	59.043	23.794	24.081	27.190
March	51.454	52.745	58.375	23.690	24.324	26.875
April	53.221	53.325	59.207	24.483	24.595	27.284
May	53.870	53.308	60.880	24.797	24.583	28 038
June	53.462	53.043	61.290	24.651	24.486	28 215
July	54.150	52.630	60.654	25.034	24.286	27.919
August	52.912	52.171	61.606	24.428	24.082	28.375
September	53.295	52.440	.....	24.567	24.209	.....
October	55.490	53.340	.....	25.596	24.594	.....
November	55.635	55.719	.....	25.680	25.649	.....
December	54.428	54.905	.....	25.160	25.349	.....
Year	53.486	53.304	.....	24.670	24.592	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	New York				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12.295	14.094	12.680	14.337	55.600	62.760
February	12.256	14.084	12.611	14.329	54.974	62 893
March	12.139	14.698	12.447	14.868	54.704	65.884
April	12.019	15.741	12.275	15.930	54.034	70.294
May	11.989	16.031	12.214	16.245	54.313	72.352
June	12.385	17 234	12.611	17.443	56.365	78.259
July	12.463	17.190	12.720	17.353	56.673	76.636
August	12.405	17.498	12.634	17.644	56.266	78.670
September	12.201	.....	12.508	.....	55.253	.....
October	12.189	.....	12.370	.....	55.170	.....
November	12.616	.....	12.769	.....	57.253	.....
December	13.552	.....	13.768	.....	62.068	.....
Year	12.376	.....	12.634	.....	55.973	.....

New York, cents per pound. London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41.255	42 529	July	42.400	44 519
February	41 614	42.962	August	43.319	45.857
March	40.157	42.577	September	39 755	.....
April	42.185	43.923	October	41.185	.....
May	43.115	46.053	November	43.125	.....
June	44.606	45 815	December	44.655	.....
			Av. Year	42.281	.....

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4.483	4.435	4.334	4.327	13 009	15.619
February	4.440	4.026	4.266	3 946	13.043	15 738
March	4.394	4.073	4.238	4.046	13 122	15.997
April	4.412	4.200	4.262	4 118	12.889	16 331
May	4.373	4.194	4.223	4 072	12 984	16 509
June	4.435	4.392	4.292	4.321	13.260	17 588
July	4.499	4.720	4.397	4.603	13 530	18 544
August	4.500	4.569	4.406	4.452	14.260	19.679
September	4.485	.....	4 356	.....	14 744	.....
October	4.265	.....	4.139	.....	15.332	.....
November	4.298	.....	4.181	.....	15.821	.....
December	4.450	.....	4.332	.....	15.648	.....
Year	4.420	.....	4.286	.....	13.970	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5.452	6.442	5.302	6.292	23.887	26.642
February	5.518	6.499	5.368	6.349	23.276	26 661
March	5.563	6.626	5.413	6.476	23.016	26.048
April	5.399	6.633	5.249	6 483	23.743	25 644
May	5.348	6.679	5.198	6.529	24.375	25.790
June	5 520	6.877	5 370	6 727	24.612	25.763
July	5.695	7.116	5 545	6 966	25.006	26 174
August	5 953	7.028	5 803	6.878	26 801	26.443
September	5 869	.....	5 719	.....	27 750	.....
October	6.102	.....	5.951	.....	27.256	.....
November	6.380	.....	6.223	.....	26.795	.....
December	6.301	.....	6.151	.....	26.849	.....
Year	5.758	.....	5.608	.....	25.281	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1911	1912	1911	1912	1911	1912
January	$15.90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15.90	15.03	14.50	13.28	14.81	14.01
March	15.90	14.95	14.65	13.66	14.96	14.10
April	15.90	15.13	14.65	13.90	15.00	14.15
May	15.90	15.14	14.30	13.90	14.72	14.12
June	15.90	15.15	14.06	14.11	14.56	14.22
July	15.90	15.15	14.03	14.38	14.53	14.38
August	15 90	15.43	14 00	14.90	14.47	14.85
September	15 90	.....	13 57	.....	14.40	.....
October	15.43	.....	13.44	.....	14.34	.....
November	14.92	.....	13.30	.....	14 25	.....
December	15.15	.....	13.10	.....	13.90	.....
Year	$15.72	.....	$13.94	.....	$14.49	.....

STOCK QUOTATIONS

COLO. SPRINGS Sept. 17

Name of Comp.	Bid.
Acacia	.04½
Cripple Cr'k Con.	.02½
C. K. & N.	.18½
Doctor Jack Pot.	.66½
Elkton Con.	.65½
El Paso	1.14½
Findlay	.06
Gold Dollar	1.17½
Gold Sovereign	.02½
Isabella	.22½
Jack Pot	.06½
Jennie Sample	.07
Lexington	.00½
Moon Anchor	.007
Old Gold	.04
Mary McKinney	.71
Pharmacist	.01½
Portland	.97
Vindicator	.85
Work	.01

SALT LAKE Sept. 17

Name of Comp.	Bid.
Beck Tunnel	.08
Black Jack	.08
Cedar Talisman	.01
Colorado Mining	.15½
Columbus Con.	.02½
Crown Point	.02½
Daly-Judge	$5.75
Grand Central	.62
Iron Blossom	1.22½
Little Bell	$.30
Lower Mammoth	.07½
Mason Valley	11.00
May Day	.16½
Nevada Hills	1.90
New York	$.03
Prince Con	1.65
Silver King Coal'n	2.85
Sioux Con.	.04½
Uncle Sam	.14
Yankee	$.11

TORONTO Sept. 17

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	7 50	Hollinger	12 25
Hudson Bay	$65.00	Imperial	.02
Temiskaming	40	Pearl Lake	.10
Wettlaufer-Lor.	44	Porcu. Gold	21
Apex	.02	Porcu. Tisdale	$.01
Central	$5 56	Preston E. D.	.01
Crown Chartered	05	Rea	25
Dobio	$.20	Standard	$.005
Dome Exten.	.09	Swastika	.05
Foley O'Brien	.13	West Dome	.05

SAN FRANCISCO Sept. 17

Name of Comp.	Clg.
COMSTOCK STOCKS	
Alta	.05
Belcher	.30
Best & Belcher	.04
Caledonia	1.01
Challenge Con.	.07
Chollar	.04
Confidence	.50
Con. Virginia	.41
Crown Point	.30
Gould & Curry	.02
Hale & Norcross	.07
Mexican	2.85
Occidental	.50
Ophir	.67
Overman	.60
Potosi	.02
Savage	.03
Sierra Nevada	.09
Union Con.	.62
Yellow Jacket	.30

Name of Comp.	Bid
MISC. NEV. & CAL.	
Belmont	9.50
Jim Butler	.70
MacNamara	.22
Midway	.55
Mont.-Tonopah	2.20
North Star	.22
West End Con.	1.62½
Atlanta	.20
Booth	.06
C.O.D. Con.	.10
Comb. Frac.	.13
Jumbo Extension	.33
Pitts.-Silver Peak	.96
Silver Pick	.10
St. Ives	.30
Tramp Con.	$.04
Argonaut	$2.50
Bunker Hill	$4.50
Central Eureka	.30
So. Eureka	$2.90

N. Y. EXCH. Sept. 17

Name of Comp.	Clg.
Amalgamated	88
Am. Agri. Chem.	58⅜
Am.Sm.&Ref.,com	86
Am. Sm. & Ref., pf.	108⅜
Am. Sm. Sec., pf. B	87⅞
Anaconda	46¾
Batopilas Min.	1⅜
BethlehemSteelpf	73
Chino	44⅝
Comstock Tunnel	$.10⅛
Federal M. & S., pf.	48
Goldfield Con.	2⅞
GreatNor.,ore. ctf.	46¼
Guggen. Exp.	58¼
Homestake	96½
Inspiration Con.	18½
Miami Copper	29½
Nat'nalLead,com.	59½
National Lead, pf.	108
Nev. Consol.	22½
Pittsburg Coal, pf.	96
Ray Con.	22⅞
Republic I&S,com.	29
Republic I & S, pf.	90
SlossSheffi'd,com.	56¼
Sloss Sheffield, pf.	$100
Tennessee Copper	43⅛
Utah Copper	66
U. S. Steel, com.	74½
U. S. Steel, pf.	113¼
Va. Car. Chem.	46

N. Y. CURB Sept. 17

Name of Comp.	Clg.
Barnes King	$ 88
Beaver Con	.45
Braden Copper	7⅛
B. C. Copper	5¼
Buffalo Mines	1.35
Caledonia	40
Con. Ariz. Sm.	11/16
Davis-Daly	2¾
Diam'field-Daisy	8
Ely Con.	.27
Florence	.82
Giroux	5⅛
Gold Hill Con.	1/16
Greene Cananea	9¾
Greenwater	05
Internat S. & R.	$124
Kerr Lake	2⅛
Keystone	2
La Rose	2⅝
McKinley-Dar-Sa.	2
Min. Co. of A. new	3
Motherlode Gold.	13/16
Nev. Utah M. & S.	$ 01
Nipissing Mines	8¾
Ohio Copper	1⅛
Pacific Sm. & M.	1/16
South Live Oak	2
South Utah M. & S.	1/16
Standard Oil (Old)	1110
Stand'd Oil of N.J.	410
Stand'd Oil Subs.	$685
Stewart	1⅛
Tonopah	7/16
Tonopah Ex.	2½
Tri-Bullion	11/16
Tularosa	7/16
Union Mines	1/16
United Cop., pfd.	10
Yukon Gold	3⅛

LONDON Sept. 18

Name of Com.	Clg.
Camp Bird	£1 8s 3d
Dolores	1 10 0
El Oro	0 15 0
Esperanza	1 17 9
Mexico Mines	7 10 0
Oroville	0 5 3
Stratton'sInd.	0 3 1½
Tomboy	1 9 0

BOSTON EXCH. Sept. 17

Name of Comp.	Clg.
Adventure	7¾
Ahmeek	345
Algomah	4¼
Allouez	45¼
Am. Zinc	31
Ariz. Com., ctfs.	4¾
Bonanza	$ 40
Boston & Corbin	6¾
Butte & Balak.	3½
Calumet & Ariz.	80¾
Calumet & Hecla.	540
Centennial	19
Cliff	5
Copper Range	58¼
Daly West	4
East Butte	14
Franklin	9¾
Granby	57
Hancock	26¾
Hedley Gold	20
Helvetia	$1
Indiana	15⅝
Island Cr'k, com.	55
Island Cr'k, pfd.	88¾
Isle Royale	34½
Keweenaw	1
Lake	36
La Salle	5¾
Mass	7¾
Michigan	2¼
Mohawk	67½
New Arcadian	3½
New Idria Quick.	7⅝
North Butte	34¾
North Lake	5
Ojibway	3¾
Old Dominion	60¾
Osceola	113
Quincy	87¼
Shannon	15⅝
Shattuck-Ariz.	22
Superior	45¼
Superior & Bost.	$1¼
Tamarack	40
Trinity	5¼
Tuolumne	2¾
U. S. Smelting	47
U. S. Smelt'g, pf.	51
Utah Apex	2¼
Utah Con.	11
Victoria	3
Winona	4¼
Wolverine	81
Wyandot	1¾

BOSTON CURB Sept. 17

Name of Comp.	Last
Bingham Mines	5¾
Boston Ely	1
Boswyocolo	.02
Butte Central	7
Cactus	.10
Calaveras	2¾
Chief Cons	1¾
Corbin	.48
Cortez	.96
Crown Reserve	3½
First Nat. Cop.	2
Majestic	.49
Mazatan	1¾
Moneta Porc.	$.05
Nevada-Douglas	3¾
New Baltic	2¼
Oneco	1¾
Raven Copper	26
Rhode Island Coal	12
San Antonio	$3
S. W. Miami	4¼
South Lake	8
Trethewey	.30
United Verde Ext.	.47
Vulture	$5

‡Last quotation.